AVON PARK AIR FORCE RANGE
Florida

ENVIRONMENTAL ASSESSMENT FOR THE INSTALLATION OF A RANGE SAFETY LIGHTING SYSTEM AT AVON PARK AIR FORCE RANGE, FLORIDA

FINAL

AUGUST 2010

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
AUG 2010		**00-00-2010 to 00-00-2010**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Final Environmental Assessment for the Installation of a Range Safety Lighting System at Avon Park Air Force Range, Florida	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **23 Wing Det 1 OL/A CEVN,29 South Boulevard,Avon Park Air Force Range,FL,33825**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**178**	

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ACC	Air Combat Command
AFB	Air Force Base
AFI	Air Force Instruction
AGL	Above Ground Level
APAFR	Avon Park Air Force Range
APE	Area of Potential Effect
ATV	All-terrain Vehicle
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGP	Construction General Permit
CZMA	Coastal Zone Management Act
DoD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FGS	Florida Grasshopper Sparrow
FKPP	Florida Kissimmee Prairie Preserve
FIRM	Flood Insurance Rate Map
FSJ	Florida Scrub Jay
FWC	Florida Fish and Wildlife Conservation Commission
g/cm^3	Grams per Cubic Meter
HMU	Habitat Management Units
INRMP	Integrated Natural Resources Management Plan
kV	Kilovolt
lbs/ft^3	pounds per cubic foot
LED	Light-emitting Diodes
m	Meters
MOA	Military Operating Area
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
nm	Nanometers
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NVG	Night-vision Goggle
ORMA	Operational Risk Management Assessment
PCN	Pre-construction Notification
RCW	Red-cockaded Woodpecker
ROA	Range Operating Agency
RSLS	Range Safety Lighting System
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SHWT	Seasonal High Water Table
TCP	Traditional Cultural Properties
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

FINAL FINDING OF NO SIGNIFICANT IMPACT AND FINDING OF NO PRACTICABLE ALTERNATIVE FOR INSTALLATION OF A RANGE SAFETY LIGHTING SYSTEM AT AVON PARK AIR FORCE RANGE

Pursuant to the Council on Environmental Quality regulations for implementing the procedural provisions of the National Environmental Policy Act of 1969, as amended, 40 Code of Federal Regulations (CFR) Parts 1500–1508, and 32 CFR Part 989, the Department of the Air Force has conducted an Environmental Assessment (EA) of the probable environmental consequences of the installation of a Range Safety Lighting System (RSLS) at Avon Park Air Force Range (APAFR).

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Proposed Action: The Proposed Action is for the Air Force to install an RSLS around the perimeter of the north and south range complexes at APAFR to allow pilots conducting nighttime ordnance training to easily see APAFR. The RSLS would consist of 30 green and infrared spectrum lights elevated on 10-foot poles and evenly spaced around the perimeter of the north and south ranges. The lights would be operated one to two nights per week for up to a few hours. Air Force Instruction (AFI) 13-212, *Range Planning and Operations* (Section 4.15, Night Operations), states that Class B ranges must have light patterns to ensure positive range and target area identification unless an Operational Risk Management Assessment (ORMA) has determined otherwise.

Alternative 1 (Preferred Alternative): Similar to the Proposed Action, Alternative 1 would install the RSLS but utilize exclusionary mapping to site the individual lights away from wetlands, floodplains, protected species and other resources in order to avoid as many environmental effects as possible.

No Action Alternative: Under this alternative, the Air Force would follow procedures set forth in an ORMA to establish and maintain safe conditions for nighttime ordnance training.

SUMMARY OF THE ANTICIPATED ENVIRONMENTAL EFFECTS

Airspace Management and Safety

There would be beneficial impacts with regard to Airspace Management and Safety.

Surface Waters, Wetlands, and Floodplains

Approximately 10 lights would be located in wetlands, but the impacts would be restricted to disturbance from the initial installation and periodic maintenance. Heavy machinery would not be used in the wetlands. No change to floodplain drainage or elevation would occur. Access routes have been designed to avoid wetlands and floodplains to the extent possible. Potential impacts to surface waters, wetlands, and floodplains would not be significant. Because AFI 13-212 states that range lighting needs to be on the perimeter of the ranges areas, the expansive wetlands or floodplains along the perimeter cannot be avoided. Though the Air Force

has selected the least impactful route for accessing these areas, minor impacts to wetlands and the floodplain are unavoidable. Only one light would be sited in the floodplain. Thus, the Air Force has prepared a Finding of No Practicable Alternative.

Biological Resources
Impacts to biological resources would be potentially adverse in the near term for a small number of sites, but not significant overall in the long term. Tree clearing poses the biggest concern for protected species, namely the red-cockaded woodpecker, because some of the trees removed are within foraging habitat. Other species such as the Florida scrub jay and Florida grasshopper sparrow may experience temporary disturbance from installation activities, and infrequent recurring disturbance from maintenance actions. The scrub jay may benefit in the long term from some vegetation removal. To discourage bird predators such as hawks from perching on the lights and preying on scrub jays or grasshopper sparrows, the Air Force would erect bird spikes on the light poles. The operation of the system and the introduction of light to an area not previously illuminated is not likely to significantly affect protected species or wildlife in general. Research has shown that the green and infrared color of the lights would not attract migratory birds or affect resident types of birds and wildlife.

Anthropogenic Resources
Significant impacts to anthropogenic resources are not anticipated. Kissimmee Prairie Preserve, a state park located 7 miles southeast of the nearest lights on the south range is a popular nighttime recreation area for astronomers and stargazers. Light from the closest RSLS lights should not be powerful enough to affect sky conditions from 7 miles away.

Cultural Resources
Impacts to cultural resources would be potentially adverse to a small number of sites but not significant overall as long as surface inspections are conducted during the installation of the RSLS. Six light placement locations have the potential to adversely affect eligible or potentially eligible sites within the project area.

Soil Resources
Significant impacts to soil resources are not anticipated. Compaction and rutting is possible at a few locations where soil types contain a lot of moisture or organic material. Access to lights in these locations would occur during dry periods.

FINDING OF NO PRACTICABLE ALTERNATIVE

Alternative 1 would not result in changes to floodplain elevations. Access through the floodplain and installation within the floodplain is required for one of the light locations for the RSLS. The installation of one 10-foot pole in the floodplain is unavoidable because of the requirement to site the RSLS around the range perimeter. Alternative 1 would also place up to 10 lights in wetlands, which could not be avoided, in order to maintain the proper spacing that creates an identifiable outline of the impact areas as seen from the air. A single 10-foot pole per light does not change the function of the wetlands. Access for light pole maintenance would be on the existing disk lines used as a fuel breaks for wildfires. Taking the above information into consideration, pursuant to Executive Order 11988, *Floodplain Management*, and Executive

Order 11990 *Protection of Wetlands,* and the authority delegated by Secretary of the Air Force Order 91.1, I find there is no practicable alternative to conducting the Preferred Alternative (Alternative 1) within the floodplain and that the action includes all practicable measures to minimize harm to the environment. This finding fulfills both the requirements of the referenced orders and 32 CFR Part 989.14 requirements for a Finding of No Practicable Alternative.

FINDING OF NO SIGNIFICANT IMPACT

After a review of the EA, Air Combat Command concludes that Alternative 1 would not have a significant adverse impact on the quality of the human or natural environment. Therefore, an Environmental Impact Statement is not required. This analysis fulfills the requirements of the National Environmental Policy Act, the President's Council on Environmental Quality, and 32 CFR Part 989.

Reference: *Final Environmental Assessment for the Installation of the Range Safety Lighting System at Avon Park Air Force Range, Florida*, August 2010.

G. Chesley

GARY D. CHESLEY, Colonel, USAF
Deputy Director, Installations and Mission Support

16 SEP 10
Date

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FINAL

ENVIRONMENTAL ASSESSMENT FOR THE INSTALLATION OF A RANGE SAFETY LIGHTING SYSTEM AT AVON PARK AIR FORCE RANGE, FLORIDA

PREPARED FOR:

23 WG Det 1 OL/A CEVN
29 South Boulevard
Avon Park Air Force Range, Florida 33825-9381

AUGUST 2010

PRINTED ON RECYCLED PAPER

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1. PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The U.S. Air Force has prepared this environmental assessment to determine the effect of a proposed Range Safety Lighting System (RSLS) around the perimeters of the impact ranges at Avon Park Air Force Range (APAFR). This analysis complies with the National Environmental Policy Act (NEPA) of 1969, as amended, 40 Code of Federal Regulations (CFR) Parts 1500–1508, and 32 CFR Part 989. The Air Force is the lead agency.

APAFR is a 106,073-acre bombing and gunnery range centrally located in peninsular Florida in Polk and Highlands Counties. It is approximately 12 miles east of the city of Avon Park and 15 miles northeast of the city of Sebring. As a military installation, APAFR has a long history of use beginning in 1942, when the War Department purchased approximately 107,000 acres from Consolidated Naval Stores Company (U.S. Air Force, 1997). APAFR is a geographically separated range that is under the command of the 23d Wing, Moody Air Force Base (AFB), Georgia. The 23d Wing is under Air Combat Command (ACC). Figure 1-1 shows the key features of APAFR.

1.2 BACKGROUND

Air Force Instruction (AFI) 13-212, *Range Planning and Operations* (Section 4.15, Night Operations), states that Class B ranges must have light patterns to ensure positive range and target area identification unless an operational risk management assessment (ORMA) has determined otherwise. The Air Force has prepared an ORMA evaluating the need for the lighting system, and while the risk is low, the Air Force has elected to install the RSLS to establish as safe an environment as possible for nighttime ordnance delivery training. The ORMA is included as Appendix A. Through the Environmental Impact Analysis Process (EIAP) using the AF 813, the Air Force evaluated the proposed lighting and recommended an environmental assessment (EA).

1.3 PURPOSE AND NEED

The purpose of the action is to ensure that pilots utilizing the APAFR ranges have clear, unmistakable recognition of the ranges at night and that nighttime ordnance training can be conducted within Air Force safety guidelines as established in AFI 13-212, Section 4.15. The lights would be beneficial to aircrews, many of which are not familiar with APAFR and some of which may be from foreign countries.

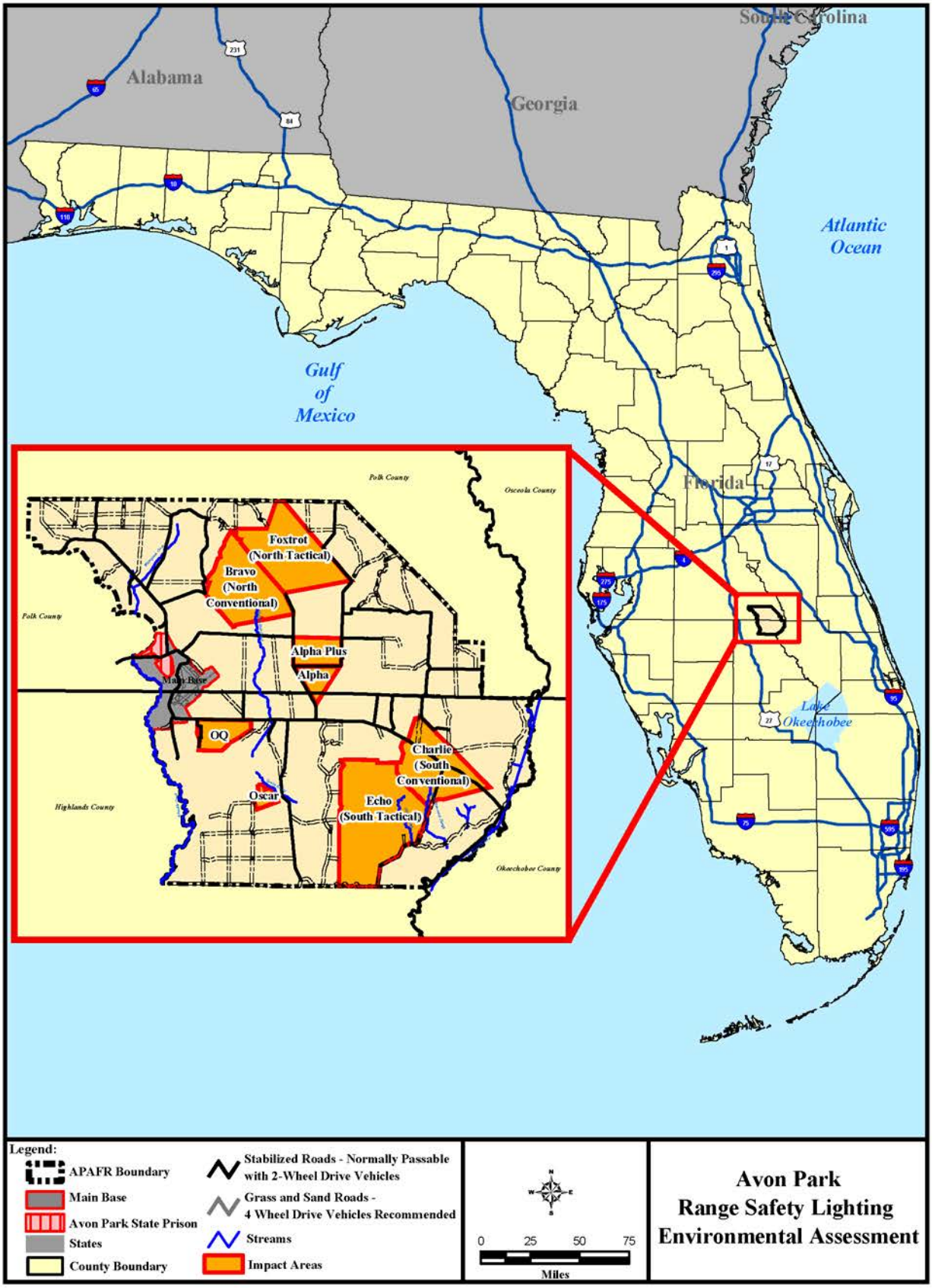


Figure 1-1. Regional Setting of APAFR

2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION: INSTALL RANGE SAFETY LIGHTING

The Air Force proposes to install an RSLS on the north (Foxtrot/Bravo) and south (Charlie/Echo) range complexes. These ranges encompass approximately 8,300 and 10,500 acres respectively. There would be a total of 30 lights encompassing the Foxtrot/Bravo and Charlie/Echo Ranges as shown in Figure 2-1. For the purposes of this EA and for ease of reference, the proposed light locations are labeled 1 through 30. The analysis of the Proposed Action assesses the impacts of establishing light around the perimeter of these ranges.

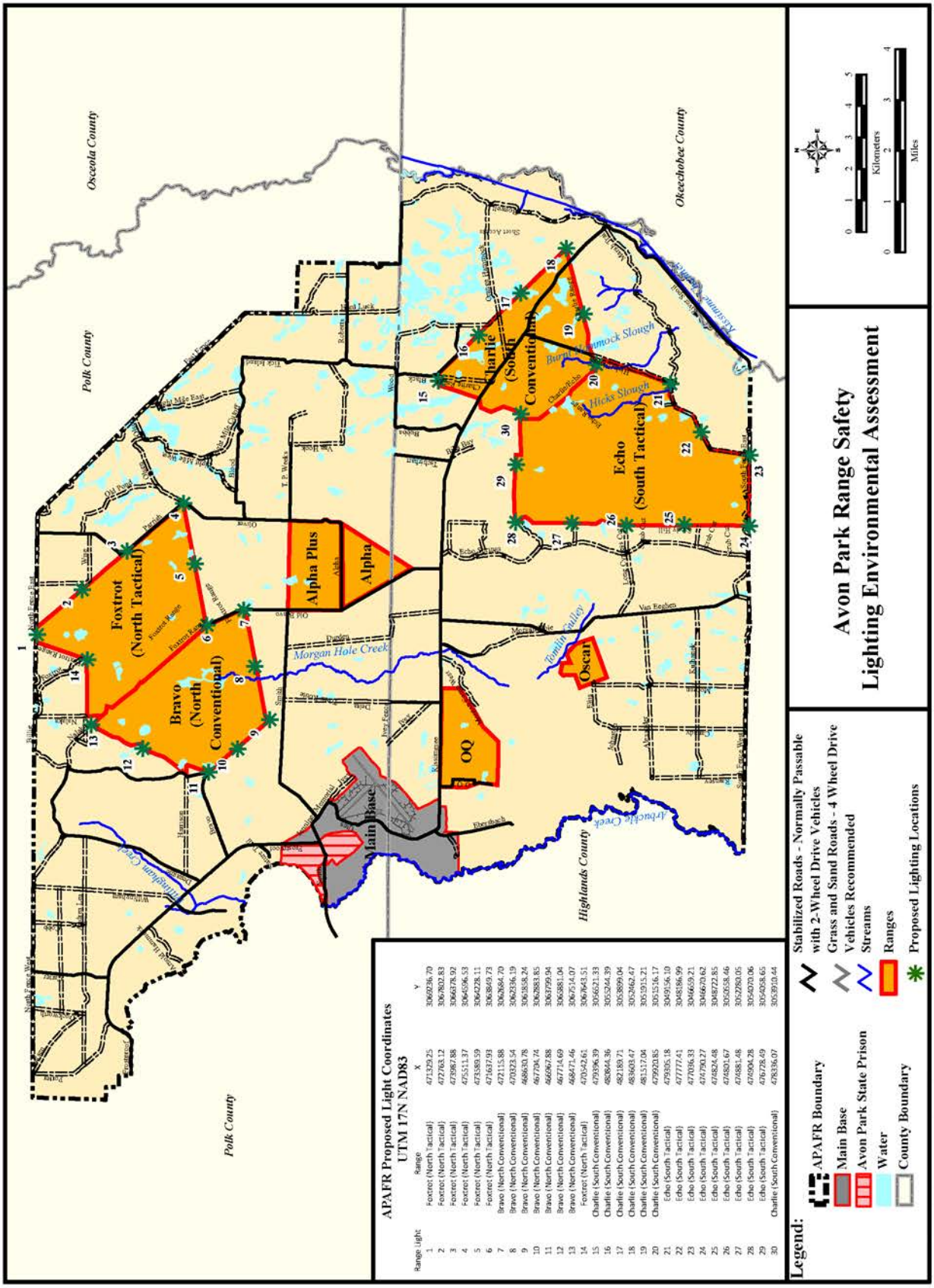
2.1.1 Description of the Range Safety Lighting System

Components and Specifications

AFI 13-212 specifies that range perimeter lights should meet the following performance requirements:

- Lights must be night-vision goggle (NVG) compatible, specifically not causing a "blooming effect" when viewed.
- Lights must have the options or settings to allow them to be both invisible to NVGs, as well as only visible to NVGs. NVG-invisible light falls within wavelengths of 430 to 525 nanometers (nm). NVG-only light falls within wavelengths of 700 to 850 nm.
- Lights must have 360-degree horizon-to-horizon coverage, meaning they must be visible from any approach direction.
- Lights must be visible by aircraft from 20,000 feet above ground level (AGL)
- Lights must be able to provide up to eight hours of illumination per night.
- Lights must have a self-contained power source, such as solar panels.

APAFR personnel considered the above requirements when developing the RSLS specifications for the APAFR range. The APAFR RSLS would consist of a solar-powered light source mounted on 10-foot poles, positioned at the corners of the ranges, and selected locations along the range perimeters. The light source would be multiple light-emitting diodes (LED) encased in a clear dome (Figure 2-2 and Figure 2-3). The diodes would emit both infrared and green light, which would fulfill the AFI 13-212 requirement of being both NVG-only visible (infrared) and NVG invisible (green spectrum). Each unit would emit 120 lumens of steady or unblinking visible light in the green spectrum and invisible infrared light. As a comparison, a 100 watt (W) incandescent bulb emits approximately 1,600 lumens (California Energy Commission, 2010). Examples from a similar system installed at Saylor Creek Range at Mountain Home AFB, Idaho, are shown in Figure 2-2 through Figure 2-5. More details on the RSLS specifications are provided in Appendix C.



APAFR Proposed Light Coordinates
UTM 17N NAD83

Range Light	Range	X	Y
1	Foxtrot (North Tactical)	471329.25	3069236.70
2	Foxtrot (North Tactical)	472763.12	3067802.83
3	Foxtrot (North Tactical)	473987.88	3066578.92
4	Foxtrot (North Tactical)	475511.37	3064596.53
5	Foxtrot (North Tactical)	473589.59	3062228.11
6	Foxtrot (North Tactical)	471637.93	3063849.73
7	Bravo (North Conventional)	472115.88	3062684.70
8	Bravo (North Conventional)	470323.54	3062336.19
9	Bravo (North Conventional)	468630.78	3063858.24
10	Bravo (North Conventional)	467704.74	3062883.85
11	Bravo (North Conventional)	466867.88	3063729.94
12	Bravo (North Conventional)	467714.69	3063881.04
13	Bravo (North Conventional)	468471.46	3067514.07
14	Foxtrot (North Tactical)	470542.61	3067643.51
15	Charlie (South Conventional)	479396.39	3056621.33
16	Charlie (South Conventional)	480844.36	3055244.39
17	Charlie (South Conventional)	482189.71	3053899.04
18	Charlie (South Conventional)	483603.47	3052462.47
19	Charlie (South Conventional)	481517.04	3051915.21
20	Charlie (South Conventional)	479920.85	3051516.17
21	Echo (South Tactical)	479305.18	3049156.10
22	Echo (South Tactical)	477777.41	3048186.99
23	Echo (South Tactical)	477036.33	3046659.21
24	Echo (South Tactical)	474790.27	3046770.62
25	Echo (South Tactical)	474824.48	3048722.85
26	Echo (South Tactical)	474801.67	3050658.46
27	Echo (South Tactical)	474881.48	3052860.05
28	Echo (South Tactical)	476904.28	3054070.06
29	Echo (South Tactical)	476728.49	3054928.65
30	Charlie (South Conventional)	478336.07	3053910.44

Figure 2-1. APAFR RSLS Proposed Light Locations

Figure 2-2. Light-emitting Diodes Used in the Saylor Creek Range RSLS

Figure 2-3. Range LED Light System Encased in Clear Dome

Figure 2-4. Solar-power Panel and LED Light at Saylor Creek Range

Figure 2-5. Example of Range Safety Light Installed on 10-foot Pole at Saylor Creek Range

LED Light Characteristics

Each individual light unit would consist of an arrangement of four Luxeon V-Star™ green spectrum LEDs, which emit light at a wavelength of 505 nm, and a center cluster of LEDtronics™ infrared LED lights, which emit light at a wavelength of 850 nm. An example of this light arrangement as it would be installed at APAFR is shown in Figure 2-3. APAFR personnel considered blue LEDs, which have been used at other ranges. However, green LEDs of the variety found with the Luxeon V-Star™ are three to four times brighter than blue LEDs, while remaining invisible to NVGs.

2.1.2 Installation (Installing in the Ground – Tree and Vegetation Removal)

The lights would be spaced approximately one mile apart and at the corners of the ranges. The Air Force would place the lights on the outside of and adjacent to existing range perimeter fence lines (Figure 2-6 through Figure 2-8) so that the installation could occur with as little tree and brush clearing as possible. However, some tree clearing would be required. Areas to be cleared would need to leave no more than four inch high stumps. Stumps that are taller than 4 inches have the potential to hit the undercarriage of vehicles, particularly in pine plantations when harvesting tress. In addition, trees would need to be limbed to eliminate ladder fuels that increase scorch height during prescribed burns and wildfires.

All light locations can be accessed from main roads, from fence line service roads, or from plantation disk lines from main roads. Exceptions are light location #18 where 0.3 miles must be traveled from a main road across a bahia grass cattle pasture. Access would be with a 4 x 4 pick-up. Construction and maintenance would be delayed if seasonal conditions are unfavorable for trafficking. Off-site road stabilization materials (e.g., shell, clay, yellow sand) will not be used for site access or maintenance. The lights would not be placed in existing firebreaks so as not to interfere with controlled burn operations. For stability, light poles would be encased in concrete in a hole dug to a depth of about 2 feet.

During equipment installation and routine maintenance, the estimated footprint within which site surface disturbance could occur (Section 2.1.3) would likely not exceed 315 square feet (20 foot diameter circle centered on each light pole). With 30 lights at 315 square feet disturbance per light, a total of 9,450 square feet or .22 acres of disturbance would occur under the Proposed

Action. Disturbances would primarily be associated with the operation of vehicles within the site footprint. This area does not include activities associated with line of sight vegetation maintenance. Figure 4-2 and Figure 4-3 in Chapter 4 show an aerial view of all ranges and those light placement locations where tree clearing would be required.

Figure 2-6. South of Bravo Range: Terrain and Fence Line

Figure 2-7. Corner of Bravo and Foxtrot Ranges: Fence Line, Terrain, and Access Road

2.1.3 Operation and Maintenance

Operation

The Air Force estimates the frequency of use would be one to two nights per week. Lights would be able to operate up to 8 hours per night, though mission personnel would only turn on the lights as needed. Mounted under a semicircular glass dome, lights would be visible from the air and from any horizontal direction. The pedestal upon which the lights would be mounted would prevent the lights from shining directly downward. Solar panels mounted on the light poles would collect power for storage in a 12-volt battery. The Air Force would remotely control the lights via radio signal.

Figure 2-8. Southwest Border of Bravo Looking Southwest Into a Buffer Area (Management Unit 3) Beyond the Fence Line

Maintenance

When maintenance is required, APAFR personnel would access the lights to the extent possible using existing roads and firebreaks. Maintenance activities include replacing batteries, maintaining vegetation around the lights, and other maintenance related to repairs due to lightning or other events. The Air Force assumes that lightning strikes will require up to six repairs or resets a year. For lights within wetland areas the Air Force would wait until the dry season to effect repairs.

Batteries

The 12-volt batteries would be disposed of in accordance with APAFR hazardous materials or recycling guidelines.

Line of Sight Considerations for Surrounding Vegetation

APAFR personnel would maintain tree heights, clearing surrounding vegetation to the extent necessary to allow aircraft pilots a clear line of sight to the RSLS. To adhere to visual guidelines described above, such as being able to see the RSLS at 20,000 feet AGL, APAFR personnel would trim or remove trees according to their height and proximity to a given light unit. The height limitations for trees are more restrictive as one moves closer to the light unit. Each lighting system may have a different tree-clearing radius, depending on the height of the vegetation and proximity of the tree to the light. Vegetation and trees below the height of the lights (10 feet) would not be removed. If vegetation and trees must be cut, cutting would occur only at the ground level using equipment such as chainsaws, and would not require any digging or vehicular machinery.

The Air Force used luminosity equations to determine that the Luxeon V-Star™ light (grouping of four) would be visible at an altitude of 20,000 feet and a viewing angle of 69.2 degrees. Figure 2-9 illustrates that as the viewing angle of an approaching aircraft remains constant, so do the ratios of altitude versus distance from the light source. Using these ratios, the height of vegetation that

would obscure the lights at a given distance was determined. In Figure 2-9, a tree that is greater than 84 feet tall and located 200 feet from the light source would interfere with the approaching pilots' ability to see the light. A tree that is greater than 40 feet tall and located 80 feet from the light source would likewise require trimming or removal (Table 2-1).

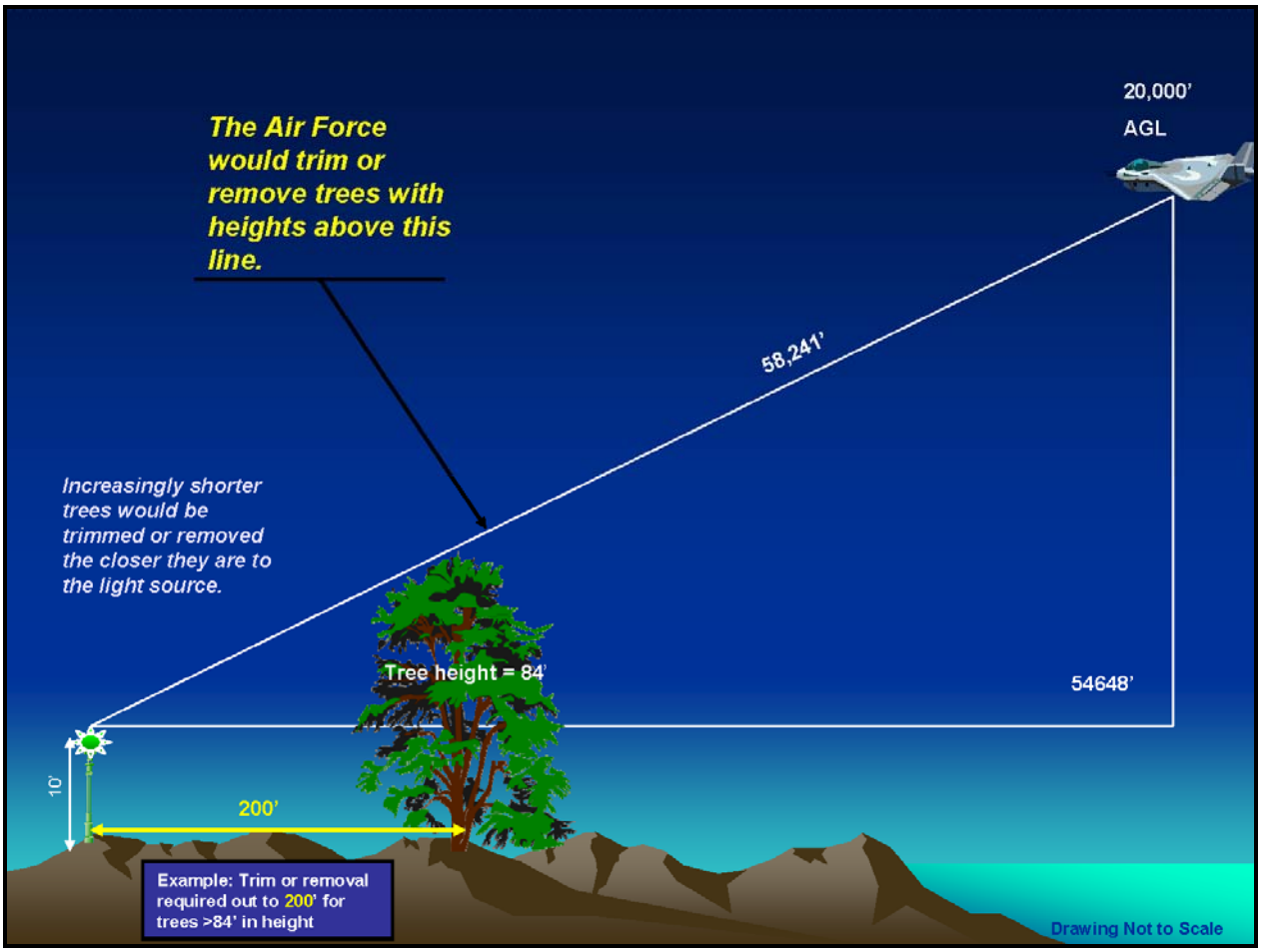


Figure 2-9. Determination of Tree Trimming and Removal

Protected Species Considerations

The Florida scrub jay (FSJ) is a federally and state listed species that nests in low dense scrub. It is anticipated that maintaining vegetation height around the lights would be beneficial to the FSJ. However, areas where lights are installed and vegetation is cut could serve as a perching spot for certain wildlife species, particularly avian predators of the FSJ. Therefore, in order to prevent avian predators from perching on the lights, bird spikes would be added to devices located in or near FSJ habitat. Bird spikes are an effective and safe solution to deter birds without harming people or wildlife, or interfering with electrical or communication transmissions.

Other Periodic Maintenance

Units may be damaged by lightning, which occurs frequently, and may require repair. Based on lightning information provided to the contractor, it would be anticipated that up to six lights would be struck annually. To minimize the potential for lightning damage, the Air Force would

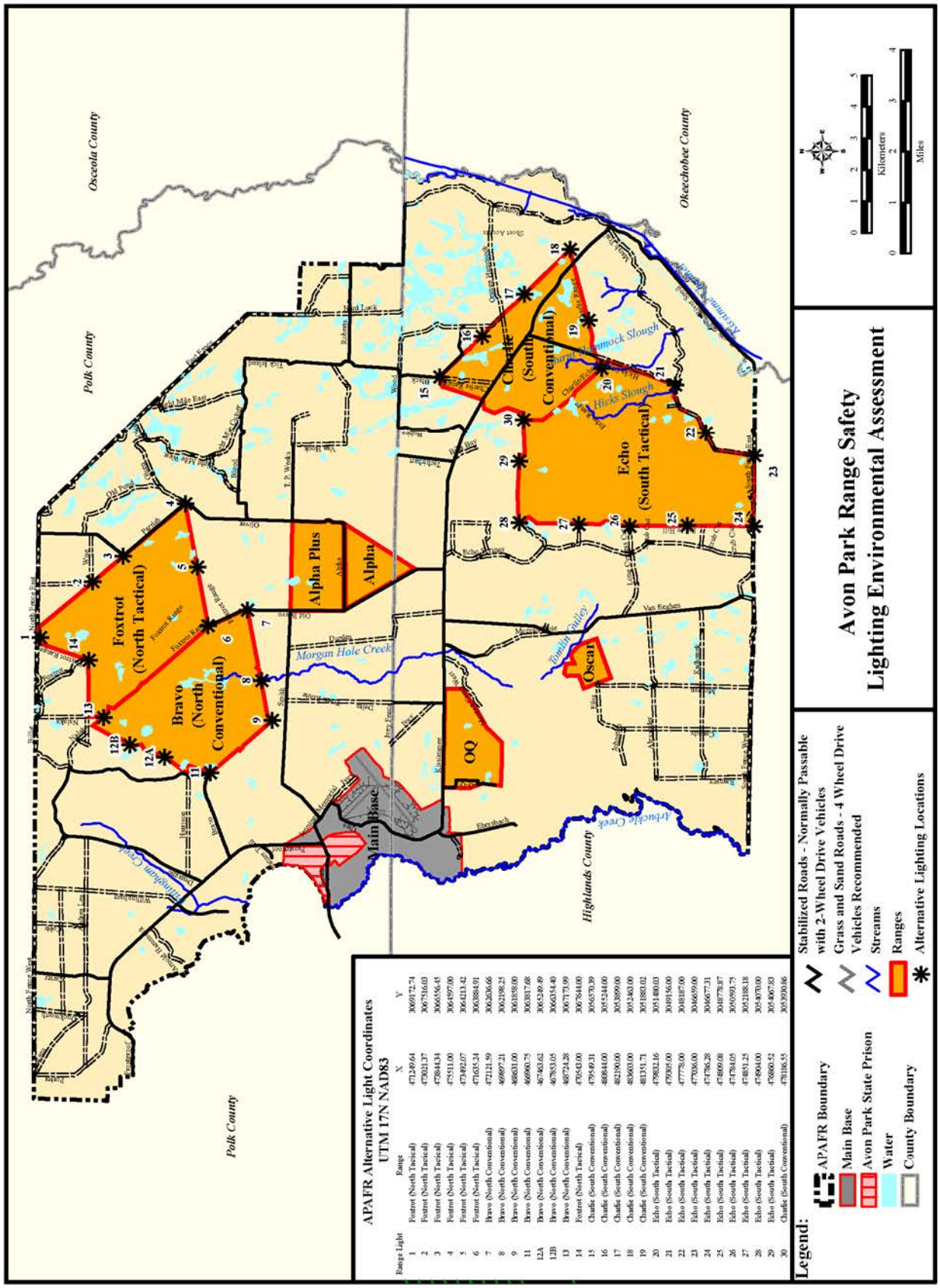
allow some space between the existing fence and the light poles, so that any fence struck by lightning would not affect the RSLS. In the event that a light is damaged, it would not need to be replaced immediately if season or weather conditions do not permit. In the event maintenance activities would be expected to cause ground disturbance, Avon Park environmental personnel would be notified to monitor repairs.

Table 2-1. Representative Tree Removal Scenarios

Distance from Light Source (in feet)	Maximum Tree Height (not blocking line of sight)
10	15
20	18
30	22
40	26
50	29
60	33
70	37
80	40
90	44
100	48
150	66
200	84

2.2 ALTERNATIVE 1: INSTALL RANGE SAFETY LIGHTING AT ALTERNATE LOCATIONS

Alternative 1 was developed in response to preliminary analysis of the light locations from the Proposed Action. APAFR natural resources personnel examined Proposed Action light locations which were found to have potential environmental effects and selected locations that avoided these effects. Thus, the Alternative 1 light locations were developed through a process of exclusionary mapping and field verification. Figure 2-10 illustrates the Alternative 1 light locations. Important noticeable differences for Alternative 1 are that on Bravo Range, Lights #10 and #12 were eliminated, and Lights #12A and #12B were added. Like the Proposed Action, Alternative 1 would install 30 lights at 315 square feet disturbance per light, for a total of .22 acres of disturbance. Access would remain the same for the alternative light locations. Other changes are less noticeable on Figure 2-10 because of the scale of the map, but changes typically involved moving a light a few hundred feet or less from its original proposed location.



APAFR Alternative Light Coordinates
UTM 17N NAD83

Range Light	Ranges	X	Y
1	Foxtrot (North Tactical)	471249.64	3069172.74
2	Foxtrot (North Tactical)	470921.37	3067516.03
3	Foxtrot (North Tactical)	470884.34	3066856.45
4	Foxtrot (North Tactical)	475511.00	3064597.00
5	Foxtrot (North Tactical)	473492.07	3064213.42
6	Foxtrot (North Tactical)	471635.24	3063884.91
7	Bravo (North Conventional)	472121.59	3062636.66
8	Bravo (North Conventional)	469897.21	3062198.25
9	Bravo (North Conventional)	469631.00	3061858.00
11	Bravo (North Conventional)	466960.75	3063817.68
12A	Bravo (North Conventional)	467463.62	3065249.49
12B	Bravo (North Conventional)	467853.05	3066354.40
13	Bravo (North Conventional)	468724.28	3067173.99
14	Foxtrot (North Tactical)	470543.00	3067644.00
15	Charlie (South Conventional)	479549.31	3066570.39
16	Charlie (South Conventional)	480844.00	3065244.00
17	Charlie (South Conventional)	482190.00	3063899.00
18	Charlie (South Conventional)	483603.00	3062463.00
19	Charlie (South Conventional)	481351.71	3061883.02
20	Echo (South Tactical)	479832.16	3061480.03
21	Echo (South Tactical)	479305.00	3061956.00
22	Echo (South Tactical)	477778.00	3061887.00
23	Echo (South Tactical)	477036.00	3060659.00
24	Echo (South Tactical)	474786.28	3060677.31
25	Echo (South Tactical)	474809.08	3061778.87
26	Echo (South Tactical)	474784.05	3059593.75
27	Echo (South Tactical)	474851.25	3052188.18
28	Echo (South Tactical)	474904.00	3054070.00
29	Echo (South Tactical)	476860.52	3054067.83
30	Charlie (South Conventional)	478198.55	3053930.86

Figure 2-10. Alternative 1 Light Locations

2.3 NO ACTION ALTERNATIVE

The No Action Alternative would be for the Air Force to continue to operate the specific areas on APAFR without the RSLS. Current and future training would not have the increased safety benefit of the RSLS for their nighttime training. Instead, the Air Force would maintain a safe range environment through a set of six procedures and management measures. These procedures, explained in detail in Appendix A (the ORMA) are:

- Identify the Hazard
- Assess the Risk
- Analyze Risk Control Measures
- Make Control Decisions
- Implement Risk Controls
- Supervise and Review

2.4 PUBLIC AND AGENCY INVOLVEMENT

A public notice for the availability of the Draft EA was published in the Lakeland Ledger and the Sebring News-Sun on November 22. The Draft EA was made available to the public by placing a copy of the document in the public libraries of Frostproof, Avon Park, and Sebring for a 30-day period beginning November 22. Copies of the Draft EA were also provided to the governments of Highland and Polk Counties. The response of Polk County to the Draft EA is presented in Appendix G. No response was received from Highland County. There were no comments from the public.

Letters of consultation were provided to the U.S. Fish and Wildlife Service (USFWS) (Appendix E) and to the State Historic Preservation Officer (SHPO) (Appendix F) for protected species and cultural resources, respectively. The appendices contain the response and concurrence letters from the USFWS and SHPO. Copies of the Draft EA and a Coastal Zone Management Act (CZMA) determination were provided to the Florida State Clearinghouse (Appendix D) for review, comment, and concurrence.

2.5 ANTICIPATED ISSUES

There are potential issues with the RSLS, as some types of lighting have been shown to affect birds, wildlife, insects, and plants. The installation and maintenance of the system would require tree trimming or removal at some locations. There is the potential that some of the trees requiring removal may be important habitat for protected species. Noise and human presence could cause temporary disturbance to protected species. Other light locations may contain cultural resources, which could be disturbed when holes are dug to install the light poles. Some light poles may have to be installed in wetlands.

2.6 REGULATORY COMPLIANCE

2.6.1 National Environmental Policy Act of 1969, as amended, 42 United States Code (USC) 4321–4347

NEPA requires that federal agencies (1) consider the consequences of an action on the environment before taking the action and (2) involve the public in the decision-making process for major federal actions that significantly affect the quality of the human environment.

2.6.2 National Historic Preservation Act of 1966, as amended, 16 USC 470

The National Historic Preservation Act requires federal agencies to (1) allow the Advisory Council on Historic Preservation to comment before taking action on properties eligible for listing on the National Register of Historic Places (NRHP) and (2) preserve such properties in accordance with statutory and regulatory provisions.

2.6.3 Endangered Species Act of 1973, as amended, 16 USC 1531–1544

The Endangered Species Act (ESA) applies to federal actions in two separate respects. First, the ESA requires that federal agencies, in consultation with the responsible wildlife agency (e.g., the USFWS), ensure that proposed actions are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of a critical habitat (16 USC 1536 [a][2]). Regulations implementing the ESA expand the consultation requirement to include those actions that may affect a listed species or adversely modify critical habitat.

Second, if an agency's proposed action would "take" a listed species, the agency must obtain an incidental take statement from the responsible wildlife agency. The ESA defines the term "take" to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt any such conduct" (16 USC 1532[19]).

2.6.4 Coastal Zone Management Act of 1972, 16 USC 1451–1456

Federal agency activities in coastal zones should be consistent with state management plans to preserve and protect coastal zones. Lands for which the federal government has sole discretion or holds in trust are excluded from the coastal zone.

The CZMA provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs for their respective coastal zones. A state's coastal zone extends seaward to 3 nautical miles, except for the Texas and Florida Gulf of Mexico coasts, where the coastal zone extends seaward to 9 nautical miles.

The CZMA requires that any federal agency activity within or outside the coastal zone that affects any land use, water use, or natural resource of the coastal zone be carried out in a manner that, to the maximum extent practicable, is consistent with the enforceable policies of National Oceanic and Atmospheric Administration (NOAA)-approved state coastal management programs. The Air Force has determined the Proposed Action would not have reasonably foreseeable effects to state coastal zone uses or resources, and the State of Florida has concurred

with the Air Force conclusion (Appendix D, *CZMA Determination*). If there were to be reasonably foreseeable effects, then the Air Force would ensure, to the maximum extent practicable, that the activities would be consistent with the enforceable policies of each respective state. Both direct and indirect effects were considered.

2.6.5 Clean Water Act of 1972, 33 USC 1251, *et seq*.

The Clean Water Act (33 USC 1151, et seq. and 1251, et seq.) established a federal program to regulate and issue permits for, the discharge of dredged and fill material into the waters of the United States, including wetlands. Section 404 pertains to wetlands. Compliance with Section 404 guidelines must be explicitly demonstrated before the U.S. Army Corps of Engineers (USACE) will issue a permit to fill, dredge, or otherwise alter a wetland. Further, Section 401 is part of the Clean Water Act also, and compliance authority has been designated by the U.S. Environmental Protection Agency (USEPA) to the State of Florida. Section 404 requires permit applicants to obtain state water quality certifications before a wetland permit can be issued.

2.6.6 Clean Air Act as Amended 1990, USC 7401-7671

Under 42 USC Sec. 7506 (c) (5), a general conformity applies only to federal actions undertaken in a nonattainment or maintenance area. Because Florida is in attainment, a Clean Air Act general conformity analysis is not required for this action.

2.6.7 Migratory Bird Treaty Act of 1918, 16 USC 703–712; 1997-Supp

The Migratory Bird Treaty Act (16 USC 703, et seq.) was enacted to ensure the protection of shared migratory bird resources. The Act prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase, or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit. The Act protects a total of 836 bird species, 58 of which are currently legally hunted as game birds. The USFWS regulations authorize permits for takes of migratory birds for activities such as scientific research, education, and depredation control. The USFWS published a final rule in the *Federal Register* (effective March 30, 2007) that directly amended 50 CFR 21, *Migratory Bird Permits*, to authorize takes resulting from otherwise lawful military readiness activities (USFWS, 2007). This rule does not authorize takes under ESA, and the USFWS retains the authority to withdraw or suspend the authorization for incidental takes occurring during military readiness activities under certain circumstances.

2.6.8 Environmental Impact Analysis Process, 32 CFR 989

This regulation provides a framework for how the Air Force is to comply with NEPA and the Council on Environmental Quality (CEQ) regulations.

2.6.9 Executive Order (EO) 11990, *Protection of Wetlands*

EO 11990, *Protection of Wetlands*, directs all federal agencies, including the military, to avoid the destruction, loss, or degradation of wetlands wherever there is a practicable alternative. The importance of public participation is also recognized by EO 11990, which directs each agency to have an early public review of plans for new construction in wetlands.

AFI 32-7041, *Water Quality Compliance*, provides a general outline of basic water management regulations applicable to the Air Force. Specific sections direct compliance with the Clean Water Act as enacted in governing USEPA and USACE regulations. The AFI requires installations to secure permits in accordance with USACE regulations if construction activities impact installation wetlands.

EO 11988, *Floodplain Management*, directs federal agencies to restore and preserve floodplains by not supporting development in floodplains; evaluating effects of potential actions; allowing public review of plans; and considering inland and water resource use.

Federal agencies must evaluate any proposed activity to determine whether it would occur within a floodplain. Agencies must address those areas that have a 1 percent chance of floodwater inundation in a given year (also known as a 100-year floodplain). EO 11988 requires federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid floodplain development whenever possible. Parts of the floodplain that are also wetlands receive further protection under the USACE's Section 404 Permit Program.

2.6.10 EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*

EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, directs federal agencies whose actions may affect migratory birds to establish and implement a Memorandum of Understanding with the USFWS to promote the conservation of migratory birds.

The Migratory Bird Treaty Act (16 USC 703–712; 1997-Supp) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, protect migratory birds and their habitats and establish a permitting process for legal taking. A migratory bird is defined by the USFWS as any species or family of birds that lives, reproduces, or migrates within or across international borders at some point during their annual life cycle. Except as permitted, for normal and routine operations such as installation support functions, actions of the Department of Defense (DoD) may not result in pursuit, hunting, taking, capturing, killing, possession, or transportation of any migratory bird, bird part, nest, or egg thereof. The DoD must address these routine operations through the Memorandum of Understanding developed in accordance with EO 13186 (DoD and USFWS, 2006). Under the 2003 National Defense Authorization Act, the Armed Forces are exempted from the incidental taking of migratory birds during military readiness activities, except in cases where an activity would likely cause a significant adverse effect on the population of a migratory bird species. As detailed in the final rule in the *Federal Register* (50 CFR 21), in this situation, the Armed Forces, in cooperation with the USFWS, must develop and implement conservation measures to mitigate or minimize the significant adverse impacts (USFWS, 2007).

2.6.11 AFI 13-212, *Range Planning and Operations*

This AFI establishes procedures for planning, construction, design, operation, and maintenance of weapons ranges and defines weapons safety footprints, buffer zones, and safest procedures for ordnance and aircraft malfunction.

2.6.12 AFI 13-201, *Air Force Airspace Management*

The Air Force manages airspace in accordance with processes and procedures detailed in AFI 13-201, *Air Force Airspace Management*. AFI 13-201 implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*, and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters*. The AFI 13-201 addresses the development and processing of Special Use Airspace and covers aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support Air Force flight operations. In addition to the above-referenced guidance documents, the Air Force utilizes Federal Aviation Administration (FAA) Order 7110.65R, *Air Traffic Control*, and FAA Order 7610.4, *Memorandum of Agreement between Department of the Air Force and Federal Aviation Administration on Safety for Space Transportation and Range Activities*.

2.7 COMPARISON OF ALTERNATIVES

Table 2-2 provides a comparison of alternatives based on analysis discussed in Chapter 4, Environmental Consequences. Alternative 1 was developed through a process of exclusionary mapping to avoid as many environmental conflicts with the siting of the RSLS lights as possible. Thus, Alternative 1 would have the lesser environmental impact.

Table 2-2. Comparison of Alternatives

Resource Analyzed	Proposed Action: Install RSLS	Alternative 1: Install RSLS at Alternate Locations	No Action
Air Space Management and Safety	The RSLS would result in beneficial effects to airspace management and safety.	Airspace management and safety benefits would be the same as for the Proposed Action.	There would be no change with regard to the current airspace management and safety environment. The procedures outlined in the ORMA would be implemented in place of an RSLS to maintain an acceptable safe environment during ordnance training.
Surface Water, Wetlands, and Floodplains	The RSLS installation would require travel through and installation in wetland and floodplain areas. Access would be prevented during wet periods.	Fewer lights are located in wetlands under this alternative, and access routes have been designed to avoid wetlands and floodplains.	No impacts.
Biological Resources/T&E Species	-There are federally listed plants near RSLS light locations #12, # 24, #26, #27, and #28. -FSJ habitat occurs at locations #6, #7, #10, #11, #13, #18, #24-#28. -FGS habitat occurs at locations #17-#22, and #30. -Tree removal would have potential adverse effects to RCW habitat at locations #12 and #16. Locations #1, #2, #13, #14, and #17 are in RCW habitat and either requires no tree clearing, or tree clearing would not reduce the quality of the habitat.	-There are federally listed plants near RSLS light locations #12A, #12B, and #24. Impacts at #12B are unavoidable; however, Alternative 1 avoids impacts at RSLS light locations #26, #27, #28. -FSJ habitat occurs at locations #6, #7, #11,#12A, #13, #18, #24-#28. -FGS habitat: no difference from the Proposed Action, though bird spikes would be used on lights to keep them from being used by raptors as perches. -RCW habitat would be adversely affected only at light #16.	No impacts.
Anthropogenic Resources	The RSLS may diminish natural dark sky conditions, potentially allowing dispersed light to reach some areas adjacent to APAFR, known as popular stargazing locations.	Alternative 1 would have the same potential for effect on dark sky conditions as the Proposed Action.	No impacts.
Cultural Resources	There are several light locations which would potentially affect known cultural resources. Consultation with the State Historic Preservation Officer would be required to resolve how best to avoid these resources, and/or survey the area.	Potential effects to cultural resources are the same for Alternative 1 as for the Proposed Action.	No impacts.

Table 2-2. Comparison of Alternatives, Cont'd

Resource Analyzed	Proposed Action: Install RSLS	Alternative 1: Install RSLS at Alternate Locations	No Action
Soil Resources	There would be no major adverse effects to soil resources though localized compaction, and rutting is possible, especially in hydric soil types. Access to light location #18 may result in unavoidable travel through hydric soil.	There would be fewer potential adverse effects to soil since Alternative 1 avoids wetlands to the extent possible.	No impacts.

APAFR = Avon Park Air Force Range; FGS = Florida grasshopper sparrow; FSJ = Florida scrub jay; ORMA = Operational Risk Management Assessment; RCW = Red-cockaded woodpecker; RSLS = range safety lighting system; T&E = threatened and endangered

3. AFFECTED ENVIRONMENT

Chapter 3 provides information regarding the environmental resources analyzed in this EA. Each resource is defined, and the potentially affected region of influence for each resource is discussed.

3.1 AIRSPACE MANAGEMENT AND SAFETY

3.1.1 Definition of the Resource

Airspace Management

Discussion of airspace is provided as background information since installation of the RSLS would not require any change to or reclassification of airspace. There are two categories of airspace or airspace areas, regulatory (which are designated through rulemaking) and nonregulatory. Regulatory airspace contains Class A, B, C, D, and E airspace areas, restricted and prohibited areas, while nonregulatory airspace contains military operating areas (MOAs), warning areas, alert areas, and controlled firing areas. Within these two categories (regulatory and nonregulatory), there are four types of airspace: Controlled, Special Use, Other, and Uncontrolled airspace. The categories and types of airspace are dictated by: (1) the complexity or density of aircraft movements; (2) the nature of the operations conducted within the airspace; (3) the level of safety required; and (4) the national and public interest (FAA, 2006).

Special Use Airspace identified for military and other governmental activities is charted and published by the National Aeronautical Charting Office in accordance with FAA Order 7400.2 and other applicable regulations and orders.

Airspace management is defined as the direction, control, and handling of flight operations in the "navigable airspace" that overlies the geopolitical borders of the United States and its territories. "Navigable airspace" is airspace above the minimum altitudes of flight prescribed by regulations under USC Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the takeoff and landing of aircraft (49 USC 40102). Congress has charged the FAA with responsibility for developing plans and policy for the use of the navigable airspace and assigning by regulation or order the use of the airspace necessary to ensure the safety of aircrafts and their efficient use (49 USC 40103(b); FAA Order 7400.2 2000).

Terminology associated with the description and assessment of this resource is defined in Table 3-1.

Safety

The region of influence for safety includes APAFR and its immediate vicinity. Flight safety considerations addressed in this section include aircraft mishaps and bird/wildlife-aircraft strike hazards. Aircraft mishaps can be the result of mid-air collisions with other aircraft or birds, collisions with ground or ground-based structures, weather-related accidents, or pilot error. The Air Force recognizes four categories of mishaps, Class A, B, C and D with Class A representing

the most severe type of accident that results in a loss of life, permanent total disability and/or loss of aircraft.

Table 3-1. Airspace Terminology

Term	Definition
Visual Flight Rules (VFR)	A standard set of rules that all pilots, both civilian and military, must follow when not operating under instrument flight rules and in visual meteorological conditions. These rules require that pilots remain clear of clouds and avoid other aircraft.
Instrument Flight Rules (IFR)	A standard set of rules that all pilots, civilian and military, must follow when operating under flight conditions that are more stringent than visual flight rules. These conditions include operating an aircraft in clouds, operating above certain altitudes prescribed by Federal Aviation Administration (FAA) regulations, and operating in some locations like major civilian airports. Air traffic control agencies ensure separation of all aircraft operating under IFR.
Above Ground Level (AGL)	Altitude expressed in feet measured above the ground surface.
Mean Sea Level (MSL)	Altitude expressed in feet measured above average sea level.
Flight Level (FL)	Airspace altitude, measured by a standard altimeter setting, designating altitudes above 18,000 feet above MSL.
Air Traffic Control (ATC)	The system used to safely direct aircraft in flight, using radar and controllers from both the FAA and the military.
Air Route Traffic Control Center	FAA-designated air traffic control centers that provide air traffic service to aircraft operating on IFR flight plans within controlled airspace, principally during the en route phase of flight.
Ceiling	The distance between the ground and the lowest cloud layer that covers more than half the sky.

3.1.2 Existing Conditions

Since, 2005 there have been over 47,000 sorties with no off-range bombs, fires or public safety issues. Predictive mishap rates using a statistical approach based on 100,000 hours of flying have been developed for APAFR ranges. Based on sortie levels described in the 2004 Navy Training Environmental Impact Statement at APAFR, there is one chance in 48,000 of a Class A mishap (U.S. Navy, 2005).

Bird/wildlife-aircraft strike hazards exist at APAFR due to the presence of migratory and resident bird populations, which are attracted to an abundance of suitable habitat such as Lake Arbuckle, Arbuckle Creek, and the Kissimmee River. From 1985 to 2001, 48,522 bird strikes occurred Air Force-wide, 20 of which resulted in the destruction of the aircraft (a Class A mishap). Most bird/wildlife-aircraft strikes occur within the airfield environment during aircraft takeoffs and landings as bird flight altitudes are generally near the ground. Other wildlife, such as deer and wild hogs can pose a strike hazard on the airfield. Smaller mammals such as rodents tend to attract predator species, such as raptors (hawks, owls). At APAFR, wildlife populations are controlled near the airfield through aggressive management techniques that involve the use of sound (recorded calls of birds in distress) as a dispersal mechanism, depredation, and habitat management.

3.2 SURFACE WATERS, WETLANDS, AND FLOODPLAINS

3.2.1 Definition of the Resource

Water resources pertain to freshwater, aquatic environments such as wetlands, rivers, creeks, streams, and aquifers. The region of influence for water resources is limited to within the APAFR boundaries.

3.2.2 Existing Conditions

Surface Waters

APAFR lies within the Kissimmee River watershed. Historically, the Kissimmee River meandered approximately 103 miles from Lake Kissimmee to Lake Okeechobee in south Central Florida. However, the river was channelized between 1962 and 1971, making it less flood-prone during high-flow storm events. In 1992, Congress authorized the Water Resources Development Act to implement the Kissimmee River Restoration Project. The project will restore over 40 square miles of river/floodplain ecosystem including 43 miles of meandering river channel and 27,000 acres of wetlands (Riverwoods Field Laboratory, 2004). The project is cost-shared by the South Florida Water Management District (SFWMD) and the USACE.

Within the boundaries of APAFR, two divisions of the Kissimmee River watershed occur. One division is a drainage area into Arbuckle Creek (which forms the western boundary of the range) and the other is drainage into the Kissimmee River (which forms a portion of the eastern range boundary). The divide between the watersheds runs essentially north to south through the middle of APAFR.

Within APAFR, several tributaries of Arbuckle Creek and Kissimmee River are present (Figure 3-1). These tributaries are characterized as slow-moving, low-gradient, low-energy waterways. The tributaries of Arbuckle Creek generally flow west and southwest, while the tributaries of the Kissimmee River flow east and southeast. The majority of surface water flow within APAFR is the result of direct precipitation on surrounding landscapes.

Lakes and wetland areas are interspersed among the tributaries and primary waterways. The lake and wetland features are essential to APAFR's floodwater storage capacity, especially in the summer months when precipitation is more abundant. Several expansive wetland areas exist on APAFR property and are discussed further in the wetlands section.

Streams

State of Florida Stream Classifications

Unless specified otherwise, the State of Florida classifies all state surface waters as Class III (suited for recreation, propagation, and maintenance of a healthy, well balanced population of fish and wildlife). Per Florida Administrative Code (FAC) Rule 62-302.400, no special circumstances exist within the Kissimmee River watershed that would necessitate a classification among lakes or tributaries other than Class III; therefore, all streams and creeks on APAFR are classified at Class III. As discussed previously, however, the Kissimmee River does feed Lake Okeechobee, which is Class I (suitable for potable water supplies).

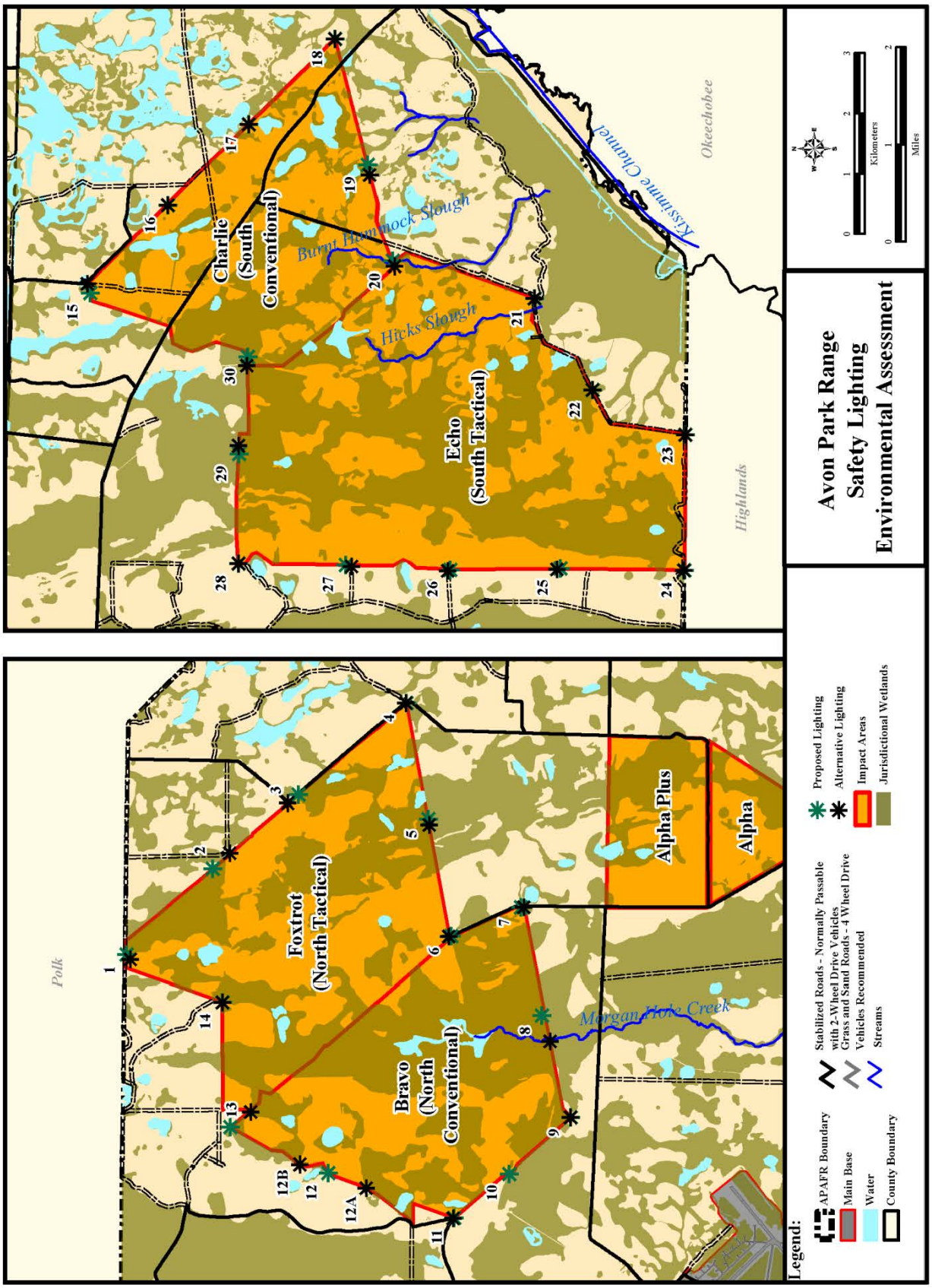


Figure 3-1. Surface Waters and Wetlands on APAFR

FAC Rule 62-302.700 also allows for special protection of certain waters, which are labeled as Outstanding Florida Waters or Outstanding National Resource Waters. No waters within APAFR meet the criteria for special protection. In accordance with the Clean Water Act, states must identify surface waters within the state that do not meet their designated use class. Within the project area, both the Kissimmee River and Arbuckle Creek are designated as Class III waters, but neither currently meets their designated use standards. Therefore, both have been placed on Florida's impaired waters list (FDEP, 2006).

When a waterbody is placed on the impaired waters list, an assessment of individual pollutants within the impaired waterbody must be conducted. From this assessment, an acceptable level of each pollutant is set as that waterbody's total maximum daily load (TMDL). The TMDL is the amount of a particular pollutant that a waterbody can absorb without violating state water quality standards. Levels of dissolved oxygen and nutrients have been indicated as the highest priority impairments within the Kissimmee River (FDEP, 2006). Dissolved oxygen levels are the highest priority impairments for Arbuckle Creek (FDEP, 2006).

Wetlands

Wetlands are defined in the USACE Wetlands Delineation Manual as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas" (USACE, 1987). The majority of jurisdictional wetlands (wetlands that fall under state or federal regulatory authority) in the United States are described using the three wetland delineation criteria: hydrophytic vegetation, hydric soils, and hydrology (USACE, 1987).

Wetland areas that occur within the project areas include Kissimmee River Marsh, Arbuckle Marsh, Blue Jordan Swamp, Deadins Pine Swamp, and several large unnamed marshes. Wetland surveys conducted at APAFR in 1996 identified 9,692 acres of jurisdictional wetlands within the project areas and 44,570 acres of jurisdictional wetlands outside of the project areas. Table 3-2 depicts the location and acreages of wetlands found within the APAFR RSLS project areas.

Table 3-2. Wetland Areas Found Within the APAFR RSLS Project Areas

Project Area	Approximate Total Wetland Acreage
Foxtrot (North Tactical)	2,073
Bravo (North Conventional)	2,515
Charlie (South Conventional)	1,400
Echo (South Tactical)	3,697
Total	**9,685**

A Section 404 permit from the USACE would be required to authorize wetland impacts that would result from the implementation of the Proposed Action. Because the Proposed Action is anticipated to have relatively minor wetland impacts, it would likely be eligible for the USACE's Nationwide Permit 12, which applies to utility lines and includes the construction of energy transmission poles. Certain conditions must be met in order for a project to qualify for this Nationwide Permit. One such condition is that all components of the Proposed Action (i.e.,

cement lighting anchors, construction of access roads, etc.) may not result in the loss of greater than 0.5 acre of wetlands. Under the Nationwide Permit, a Pre-construction Notification (PCN) must be submitted to the USACE prior to implementation of the project.

If it is determined that the components of the Proposed Action would result in greater than 0.5 acre of wetland loss, then a Nationwide Permit would no longer apply and the APAFR would need to apply for an Individual Permit under Section 404 of the Clean Water Act. Individual permits are required for projects with impacts greater than 0.5 acre, and applications for such permits require a full public interest review. A public notice is provided to all interested persons, and comments received during the public notice period are evaluated to determine whether the project is contrary to the public's interest. The time required for processing an Individual Permit is typically much greater than what is required for a Nationwide Permit.

At APAFR, the SFWMD maintains the regulatory authority for Section 401 of the Clean Water Act, and also for any activities that might affect or occur in isolated wetlands. According to FAC Rule 40E-4.051, *Exemptions from Permitting*, the SFWMD will exempt from regulation under Section 373, Part IV Florida Statutes those activities that will only have minimal or insignificant individual or cumulative adverse impacts on water resources of the state. Section 40E-4.051(5)(a) through (5)(d)[1 1-13] provides criteria for exemption for transmission and distribution lines and utility poles. As related to the Proposed Action, utility poles may be exempt from permitting provided the following criteria are met:

- Use of 35 kilovolt (kV) or less;
- Anchoring device must be steel guy wires fastened to the ground without the need for dredging, and the base must be a concrete or steel foundation not exceeding 4 feet in radius;
- No more than 15 utility poles may be installed, removed, or replaced in wetlands;
- No impacts in forested wetlands located within 550 feet from a waterbody designated as an Outstanding Florida Water or an Outstanding Natural Resource Water may occur;
- No dredging or filling of fill pads for access roads, except for temporary mats; and
- Installation of utility poles and associated bases and anchoring devices shall not interfere with navigation or impede water flow of a wetland.

Floodplains

Floodplains are lowland areas adjacent to surface water bodies (i.e., lakes, wetlands, and rivers), where flooding events periodically cover flat areas with water. Floodplain vegetation and soils act as water filters, intercepting surface water runoff before it reaches lakes, streams, or rivers and store floodwaters during flood events. This filtration process aids in the removal of excess nutrients, pollutants, and sediments from the water and helps reduce the need for costly cleanups and sediment removal. Conversely, if soils and sediments are contaminated, these contaminants can then be deposited on floodplains.

EO 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development where there is a practicable alternative.

Federal regulations permit development in the 100-year floodplain if it is demonstrated through a hydraulic analysis that the development would meet the requirements set forth by the Federal Emergency Management Agency (FEMA). These requirements allow encroachment in the 100-year floodplain as long as the base flood elevation does not increase by more than one foot. The 100-year floodplain boundary delineates a flood elevation that has a 1-percent chance of being equaled or exceeded each year.

In support of an environmental impact statement prepared for APAFR in 2005, APAFR staff determined the extent of the 100-year floodplain utilizing the FEMA Flood Insurance Rate Maps (FIRMs). It was determined that approximately 28,647 acres of 100-year floodplain are present on APAFR. Most of these areas are associated with the Kissimmee River, Arbuckle Creek, and Morgan Hole Creek, as well as with various slough and wetland areas throughout the range (Figure 3-2). Table 3-3 depicts the acreages of floodplains found within the APAFR RSLS project area.

Table 3-3. Floodplain Areas Found Within the APAFR RSLS Project Areas

Project Area	Total Floodplain Acreage
Foxtrot (North Tactical)	205.37
Bravo (North Conventional)	263.22
Charlie (South Conventional)	953.31
Echo (South Tactical)	1,413.67
Total	**2,835.57**

Coastal Zone

The term *coastal zone* is defined as coastal waters and adjacent shorelands strongly influenced by each other and in proximity to the several coastal states, and including islands, transitional and inner tidal areas, salt marshes, wetlands, and beaches. The entire State of Florida is considered part of the coastal zone and is subject to the CZMA. Since some components of the Proposed Action would take place within the jurisdictional concerns of the Florida Department of Environmental Protection (FDEP) (i.e., wetlands), a consistency determination with respect to

Florida's Coastal Zone Management Plan and the CZMA would be required (Appendix D, *CZMA Determination*).

Storm Water

The 1972 amendments to the Clean Water Act prohibit the discharge of any pollutant to waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. An NPDES permit is also required for any construction activities that disturb greater than 1 acre of land. Currently, APAFR operates under an NPDES permit for industrial activities in the cantonment area. If it is determined that greater than 1 acre of land would be disturbed, then a NPDES permit for construction activities would be required. The State of Florida also requires a "Construction General Permit" for any construction activities greater than 1 acre, which entails a Notice of Intent and a possible Storm Water Pollution Prevention Plan (Construction General Permit [CGP]). In addition, the Air Force requires Best Management Practices be in place, regardless of the size of the projects, should there be any potential for sediment to leave the site of construction.

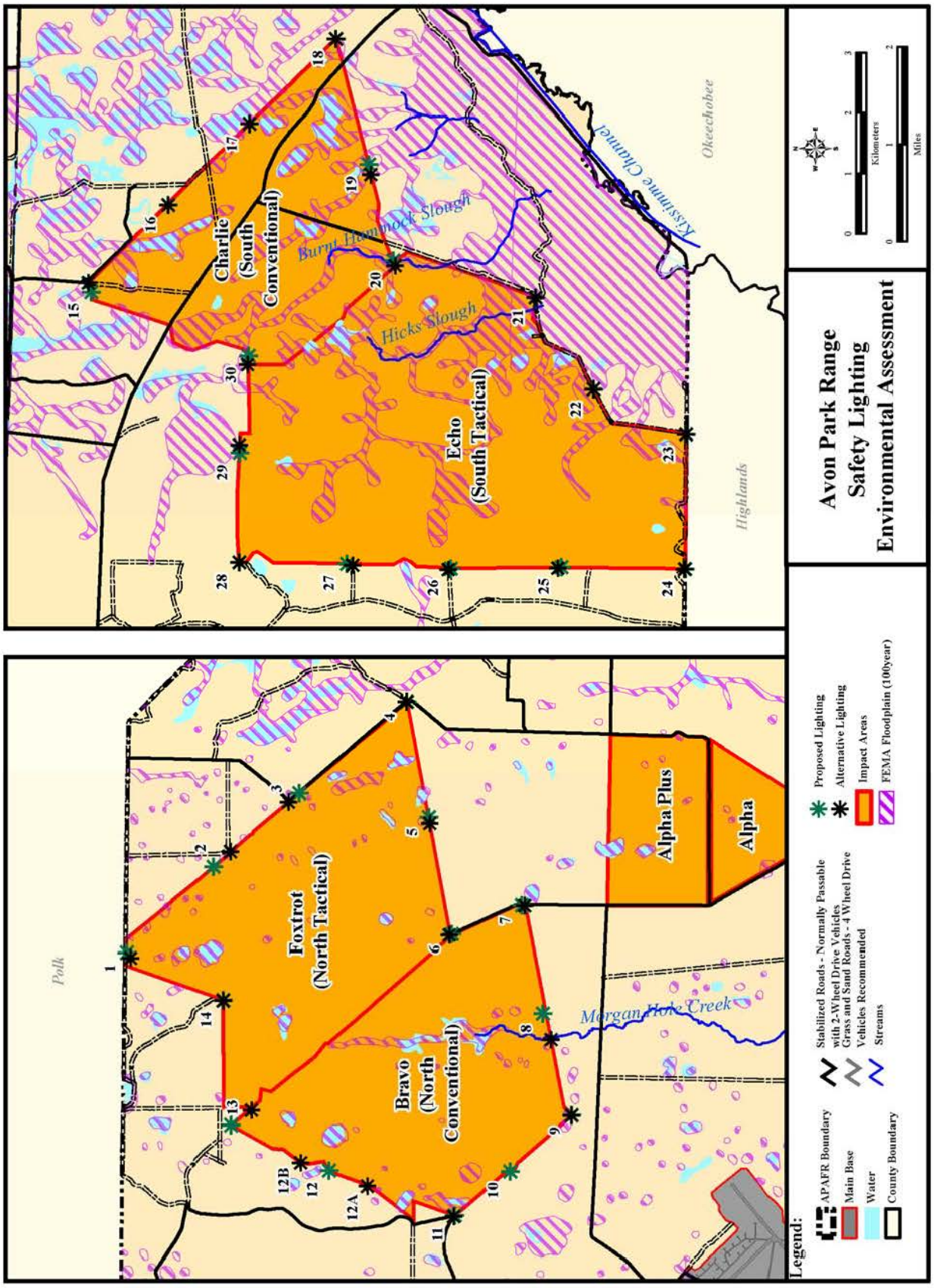


Figure 3-2. Floodplains on APAFR

3.3 BIOLOGICAL RESOURCES

3.3.1 Definition of the Resource

Biological species included in the affected environment are those animals or plants that would be subject to direct or indirect effects of the RSLS, or from the installation and maintenance of the system. This section provides information on wildlife in general, migratory birds and identifies those species with federal or state protection that occur or have the potential to occur on APAFR.

3.3.2 Existing Conditions

APAFR is an important strategic defense installation, managed for military activities, but because of its restricted access also serves as an area of natural resource conservation (U.S. Air Force, 2000a). At 106,070 acres, APAFR is the largest controlled access area in the vicinity of the Lake Wales Ridge (U.S. Air Force, 2000a).

APAFR maintains a diversity of native species because there are large areas of natural land that function to serve as a buffer between areas of military training, the accessibility to many areas of APAFR is limited, and the range is sparsely developed. Plant inventories indicate there are over 1,000 vascular plant species on APAFR, representing approximately 40 percent of all native vascular species known to occur in south-central Florida (Orzell, 1997). More than 50 percent of APAFR meets the standard of the Florida Natural Areas Inventory as a "natural area" (Orzell, 1997), though there are no areas of APAFR that have not been affected by some type of anthropogenic (human-related or caused) influence, such as grazing, military training, forestry management, invasive or introduced species (i.e., wild hogs) and single-species endangered species management.

Approximately 82,393 acres of APAFR are characterized by seven upper-level vegetative plant communities, including upland communities of cutthroat grass, hardwood hammocks, wetlands, pine flatwoods, scrub, prairie, sandhills, and pasture. Within each of these plant communities are further subsets more specific to the types of vegetation present. Managed areas of pine plantations and tame grass make up another 20,000 and 1,800 acres of APAFR, respectively. Freshwater aquatic communities, including streams, ponds, and lakes are also common across APAFR. The focus of this description is on those communities occurring along the perimeter of the Foxtrot/Bravo and Charlie/Echo ranges.

Plant Communities and Associated Wildlife

Cutthroat Plant Community

Cutthroat grass communities are generally found in seepage slope areas but may also occur in flatwoods, wet prairies, and depressional marshes, and include the cutthroat flatwoods and forested cutthroat flatwoods subclassifications. These communities are dependent on fire to maintain their open, grassy character, and fire suppression and drainage represent the greatest threats to their integrity (USFWS, 1999). APAFR contains more than 14,300 acres of cutthroat grass communities, representing the largest extent remaining for these communities in south-central Florida. This community type is an important habitat for many state-listed plant species, including hartwrightia, southern red lily, and yellow fringeless orchid (USFWS, 1999).

Pitcher plants (*Sarracenia minor*), sundews (*Drosera capillaris*), and orchids (*Calopogon barbatus, Pogonia ophioglossoides*) are typical species of cutthroat plant communities. The South Florida Multi-Species Recovery Plan for Ecological Communities reports a total of 234 seepage slope plant taxa from APAFR collections dated June 1993 to July 1995. The largest plant families were Poaceae (Grasses), Cyperaceae (Sedges), Asteraceae (Aster Family), Xyridaceae (Yellow-eyed Grass Family), Orchidaceae (Orchids), Ericaceae (Heath Family), and Eriocaulaceae (Pipewort Family). The genus *Rhynchospora* (sedges) was represented by 17 taxa. Cutthroat communities are subdivided into eleven zones based on soil dryness and drainage characteristics, and the types of plants present (U.S. Fish and Wildlife Service [USFWS], 2007). Currently, there is little information available on associated wildlife in cutthroat plant communities; however, it is likely that the eastern indigo snake inhabits the community (USFWS, 1999).

Hammocks

Hammocks are areas where hardwoods are the dominant species in the overstory based on their ability to outcompete pine because of a variety of factors relating to hydrology, geography, soils, and disturbance history. Similar to pine flatwoods, hardwood hammocks may be divided into three groups based on hydrologic conditions and fire disturbance history (dry, mesic, and wet hammocks).

Dry hammocks, or "xeric" hammocks, often succeed a sandhill or scrub community that has not been disturbed by fire. In these communities, sand live oak, laurel oak, pignut hickory, live oak, saw palmetto, and American beautyberry are common. Once established, fire tends to be catastrophic in these communities, resulting in a change to dry prairie or dry flatwoods communities (Bridges, 2000). Dry hammocks are the most extensive of the hammock communities on APAFR, occupying 2,200 acres in the Kissimmee River Valley escarpment and on the bombing range ridge. Associated wildlife species include gopher frog, gopher tortoise, Florida pine snake, short-tailed snake, Cooper's hawk, and the Florida black bear.

Mesic hammocks often develop from mesic or wet pine flatwoods in the absence of fire disturbance. They are generally areas with a well-developed canopy containing species such as live oak, laurel oak, saw palmetto, marlberry, and shortleaf wild coffee. Mesic hammocks can tolerate infrequent, low-intensity fire regimes. On APAFR, mesic hammocks are limited in extent and account for a scant 50 acres in the southeast corner of APAFR. Associated wildlife species include Florida panther, key deer, eastern indigo snake, bald eagle, Bachman's warbler, and Audubon's crested caracara (USFWS, 1999).

Wet hammocks, or "hydric" hammocks, are a wetland community often found in proximity to other wetland communities. Common species, in addition to oaks, include sweet bay magnolia, cabbage palms, dahoon holly, as well as many species of ferns. There are approximately 100 acres of wet hammock on APAFR near Eight Mile Hammock and the Arbuckle Creek floodplain. Associated wildlife species include crested caracara, eastern indigo snake, Seminole bat, Florida black bear, and flatwoods salamander

Wetlands

Swamps

Swamp communities on APAFR are generally forested wetland areas fed by surface water associated with floodplains or where the water table is near or above the surface for an extended portion of the year (200 to 300 days per year). At APAFR, dome swamps and baygalls are the two predominant swamp communities. Both are hardwood-dominated because of minimal fire disturbance and inundated soils.

Dome swamps are shallow, circular depressional areas that visually appear as a dome because shorter, smaller trees grow in the shallower edge of the depression, with taller trees growing in the deeper waters of the center. Common species include pond cypress, swamp tupelo, pond pine, chain fern, maidencane, and various grasses and sedges. Associated wildlife species include flatwood salamanders and wading birds such as white ibis and wood stork (FNAI, 2009).

Baygalls are often found at the base of sandy slopes and the edges of floodplains where they are fed by groundwater seepage or occasional flooding. They tend to be highly diverse hardwoods with closed canopies. Common species include sweetbay, swamp red bay, loblolly bay, dahoon holly, wax myrtle, marlberry, and cinnamon fern. Associated wildlife species include Florida black bears; critical support is provided for wading bird rookeries (FNAI, 2009)

Marshes

In contrast to wetland communities dominated by forested canopies of hardwoods or pine, marshes are herbaceous systems. On APAFR, the predominant marsh types are floodplain marsh, depressional marsh, and wet prairies.

Floodplain marshes are geographically and hydrologically connected with riverine systems. At APAFR, floodplain marshes are associated with the Kissimmee River. Major species include sawgrass, buttonbush, and maidencane. Associated wildlife species include black rail; limpkin; bald eagle; and wading birds such as white ibis, great egret, little blue heron, snowy egret, tricolored heron, black-crowned night-heron, and yellow-crowned night-heron (FNAI, 2009).

Depressional marshes are shallow, usually round depressions that are normally found throughout the flatwoods and prairies of Florida. Vegetation is generally segregated within this community by water depth and length of inundation. The edge of the depression marsh may contain saw palmetto, maidencane, cutthroat grass, and St. John's wort where standing water exists. In deeper standing water, species such as sawgrass and pickerelweed may dominate. Fire is an important regulator of this community type, preventing hardwood encroachment and invasion. Associated wildlife species include the reticulated flatwoods salamander, striped newt, gopher frog, wading birds, and the eastern indigo snake.

Wet prairies are very diverse and variable because of short hydroperiods and inconsistent hydrologic conditions. Their herbaceous nature and shifting conditions may cause dominant species to rapidly shift between species adapted for flooded conditions to ones adapted for drought conditions. Common species include cutthroat grass, beakrushes, and flat sedges.

Associated wildlife species include Florida panther, key deer, rice rat, Audubon's crested caracara, bald eagle, Florida grasshopper sparrow, wood stork, and eastern indigo snake (USFWS, 1999).

Seepage Slopes

Seepage slopes are wetland communities that are characterized by shrub thickets and boggy meadows where soils are saturated rather than inundated by downslope seepage. They generally occur where water percolating through well-drained soil types meets an impermeable layer and is forced close to the surface. Common plant species include slash pine, dahoon holly, gallberry, wax myrtle, blueberry, fetterbush, possumhaw, cutthroat grass, and laurel greenbrier.

Pine Flatwoods

Pine flatwood ecosystems vary with hydrologic condition and can be divided into wet, mesic, and dry (or scrubby) flatwoods. Pine flatwoods are widespread on APAFR with longleaf pine and slash pine dominating the overstory in most areas. In some dry flatwood communities, sand pine may also be found. Pine flatwood forests and savannahs are usually a two-layered vegetative community with a moderately dense to sparse coniferous overstory, little understory, and a sparse to dense groundcover of grasses, forbs, and shrubs.

Wet flatwoods are characterized by a water table close to or above the surface where complete inundation of the soil lasts for a month or more. Cabbage palms and saw palmetto mix with pine in the overstory while various sedges, such as beakrush, nutsedge, and fimbry may be found dominating the groundcover with other grasses. Fire is an important disturbance element within wet flatwood communities, preventing succession into hardwood-dominated forests. Associated wildlife species include oak toad, cricket frog, chorus frog, black racer, rat snake, red-shouldered hawk, bobwhite, opossum, cottontail rabbit, cotton rat, cotton mouse, raccoon, striped skunk, bobcat, and white-tailed deer.

Mesic flatwoods are characterized by a water table near the surface. During the rainy season, water inundates the soil and will frequently stand on the surface for briefs periods. During the dry season, groundwater may be unobtainable for shallow-rooted species. For many species found in mesic flatwoods communities, balancing the stress of water saturation during the rainy season and the stress of dehydration during the dry seasons presents a challenge to their survival. Similar to wet flatwood communities, mesic flatwoods are dependent upon fire to prevent succession toward a more hardwood-dominated community type. Mesic flatwoods can also be thought of as a mid-point between wet flatwoods and dry prairies or scrubby flatwoods. Differences among these communities are related to minor topographic changes, variations in fire history and site-specific hydrologic characteristics. Common plant species include St. John's wort, saw palmetto, dwarf huckleberry, fetterbush, dwarf wax myrtle, staggerbush, yellow-eyed grass, and cutthroat grass. Associated wildlife species include oak toad, little grass frog, narrowmouth toad, black racer, rat snake, southeastern kestrel, brown-headed nuthatch, pine warbler, red-cockaded woodpecker (RCW), Bachman's sparrow, cotton rat, cotton mouse, wild hogs, raccoon, gray fox, bobcat, and white-tailed deer.

Dry flatwoods are characterized by relatively deep water tables (greater than 30 centimeters), an open sparse overstory, and a sparse shrubby understory with numerous patches of bare ground. Common plant species include scrub oak, live oak, dwarf live oak, myrtle oak, fetterbushes, and

tarflower. Associated wildlife species include red widow spider, scrub wolf spider, Florida scrub lizard, six-lined racerunner, coachwhip, ground dove, loggerhead shrike, yellow-rumped warbler, eastern towhee, Florida mouse, and spotted skunk.

Scrub

Scrub communities are dense to sparse canopied communities found on areas of higher elevations with well-drained sandy soils and low nutrient levels. Florida scrub can be classified into two categories: coastal or interior (USFWS, 1999). Evergreen oaks, sand pines, or rosemary (*Ceratiola ericoides*) can dominate scrub vegetation. Stand densities and canopy heights of pines and shrubs can vary among scrub sites, depending on the fire history. Without fire, pine stands tend to develop a closed canopy. Central Florida ridge scrub can generally be grouped into three types, although gradations exist among the three. The rosemary scrub, also referred to as rosemary bald, often may consist of pure stands of rosemary. Oak scrub is dominated by evergreen oaks with hard, thick leaves (i.e., *sclerophyllous*). Sand pine scrub is characterized by open-to-dense canopy sand pines.

Sand pine scrub communities are generally even-aged with canopy closures dependent on their fire history with an oak understory. These communities are intermediate between scrub and high pine and have also been referred to as turkey oak or scrubby high pine (USFWS, 1999). Oak scrub communities are dominated by oak with little to no sand pine. Common plant species found in both communities include rusty lyonia, saw palmetto, scrub hickory, rosemary, ground lichens, nodding pinweed, pigeonwing, Curtiss' milkweed, and wiregrass. The scrub community along Frostproof Road has turkey oak and a different species composition than the Bombing Range Ridge Scrub, which is dominated by four different oak species including Chapman's oak, sand live oak, myrtle or scrub oak, and scattered sand pine.

Florida scrub, a xeric shrubland, has been strongly evolutionarily influenced by fire, regular winter drought, and acidic, low-nutrient soils (Ostertag and Menges, 1994). Oak scrub is characterized by myrtle oak, sand live oak, Chapman's oak (*Quercus myrtifolia, Q. geminata,* and *Q. chapmanii*), rusty lyonia (*Lyonia ferruginea*), scrub hickory (*Carya floridana*), hog plum (*Ximenia americana*), and scrub bay (*Persea borbonia* var. *humilis*). Scrub palmetto (*Sabal etonia*) and stunted saw palmetto (*Serenoa repens*) can occur in the lower shrub layer. Groundcover consists mostly of sprouts of the shrub layer species; herbs are generally scarce. The most common herbaceous species include beak rush (*Rhynchospora megalocarpa*), milk peas (*Galactia* spp.), alicia (*Chapmannia floridana*), and panic grass (*Dichanthelium ensifolium* var. *breve*). Epiphytes such as Spanish moss (*Tillandsia usneoides*) and ball moss (*Tillandsia recurvata*), true mosses, and lichens are present. *Tillandsia recurvata* is prevalent in mature scrub, whereas *T. usneoides* is more common in southern ridge sandhills.

Rosemary-dominated scrub is an open community, with the shrub layer dominated by even-aged stands of rosemary. Although rosemary scrubs or rosemary balds do not occur at APAFR, a description of this community is included for comparison. Rosemary often forms nearly pure stands, which may be interspersed with clumps of oaks, especially *Quercus inopina*. Sand pine is often scarce and may even be absent in small patches. Consistently present, but making up less than 5 percent of the cover, are the palmettos (*Serenoa repens* and *Sabal etonia*), and rusty lyonia (*Lyonia ferruginea*). Herbaceous species are mostly perennial, many of which are

narrowly endemic to this community, such as *Liatris ohlingerae, Eryngium cuneifolium*, *Hypericum cumulicola*, and *Lechea cernua*. Lichens, such as *Cladonia evansi*, *C. leporina*, *C. prostrata*, and *C. subtenuis*, cover more of the area between the shrubs than does the herbaceous flora. In the first few years after fires, the spike moss, *Selaginella arenicola*, is usually abundant, but after about 20 years the *Cladonia* overgrow it and may eliminate it from the stand. The rosemary phase of scrub is often referred to as "ancient scrub" and is a community type endemic to Florida but does not occur on APAFR. Compared with other types of Florida scrub, rosemary-dominated scrub occupies the most xeric, infrequently burned landscape positions (Abrahamson et al., 1984; Gibson and Menges, 1994).

Some 5,628.42 acres are currently mapped as "scrub" of which 1,281.07 acres are classified as "sand pine" in the APAFR geographic information system (GIS) plant community coverage for the base. Based upon field surveys, the 5,628.42 number includes acreage which should be considered as scrubby flatwoods. Scrub at Avon Park AFR is primarily restricted to the ridge top of the Bombing Range Ridge and to a few isolated scrubs on the Osceola Plain. When compared with other nearby central Florida ridge ecosystems, Avon Park AFR scrubs are conspicuous in the absence of southern Lake Wales Ridge scrub endemic species (see above description of rosemary scrub). This may be due to the Bombing Range Ridge being a unique geomorphic feature distinct from the Lake Wales Ridge and, therefore, a biogeographically distinct ridge from other southern Central Florida ridges.

Rare species that may be found associated with scrub at APAFR include the Florida scrub lizard (*Scelophorus woodi*), FSJ (*Aphelocoma coerulescens coerulescens*) (FNAI and DNR, 1990), Curtiss' milkweed (*Asclepias curtissii*), pigeon-wing (*Clitoria fragrans*), nodding pinweed (*Lechea cernua*), and hairy jointweed (*Polygonella basiramia*).

Associated wildlife species of Florida scrub communities include red widow spider, oak toad, Florida scrub lizard, six-lined racerunner, coachwhip, loggerhead shrike, FSJ, gopher tortoise, yellow-rumped warbler, eastern towhee, Florida mouse, and spotted skunk.

Dry Prairie

Dry prairies are grass-dominated areas nearly devoid of trees with a dense groundcover of wiregrass, saw palmetto, and shrubs. These areas would typically convert to mesic flatwoods if fire intervals and dense groundcover did not suppress tree growth. The dry prairie community on APAFR is an important habitat for the Florida grasshopper sparrow (FGS). Other associated species include six-lined racerunner, black racer, coachwhip, turkey vulture, wild coco, bobwhite quail, loggerhead shrike, eastern meadowlark, least shrew, harvest mouse, and the occasional Audubon's crested caracara.

Sandhills

Sandhills are savannah-like systems with a pine overstory and well-drained sandy soils low in nutrients. These are ecosystems that are considered to be forests maintained by frequent fires, which prevent succession towards hardwood hammock or scrub communities. Small but important areas of sandhills exist on APAFR and represent an outstanding high-quality example of this increasingly rare community type in south-central Florida (Bridges, 2000). APAFR sandhill areas are home to pigeonwing, a federally listed species. Common species include

longleaf pine, slash pine turkey oak, scrub hickory, sand live oak, sand pine, saw palmetto, rusty lyonia, wiregrass, sandhill lupines, Florida alicia, and bluestems. Associated wildlife species include gopher frog, gopher tortoise, eastern indigo snake, Florida pine snake, southeastern American kestrel, Florida mouse, and several species of beetles and grasshoppers.

Protected Species

There are 28 species of plants and wildlife designated as threatened or endangered by the federal government and/or the State of Florida that occur on or near APAFR. Federally listed species are protected under the ESA of 1973 (16 USC 1531, et seq.). By ESA definitions, an *endangered* species is one that is in danger of extinction throughout all or a significant portion of its range. A *threatened* species is any species that is likely to become endangered in the future throughout all or a significant portion of its range. A *candidate* species has been petitioned for listing under the ESA. The listing of protected species under ESA is maintained and updated by the USFWS (50 CFR 17.11-12). For state-listed animals, the Florida Fish and Wildlife Conservation Commission (FWC) bears this responsibility in accordance with FAC Rule 68A-27. The Florida Department of Agriculture and Consumer Services maintains the list of state threatened and endangered plant species under state law (FAC, Chapter 5B-40).

APAFR actively conserves candidate, endangered, and threatened species that are federally listed (U.S. Air Force, 2006). APAFR's *Final Draft Integrated Natural Resources Management Plan* (INRMP) (U.S. Air Force, 1997) identifies an overall goal to "protect, restore, and maintain populations of native threatened and endangered plant and animal species within an ecosystem framework." The Integrated Natural Resources Management Plan (INRMP) outlines specific standards and guidelines that restrict or limit management practices designed to provide adequate protective measures for the natural resources of APAFR while allowing realistic and critically important military training to occur. Consult the INRMP for more information on installation-wide standards and guidelines.

Protected Plant Species

APAFR is presently home to 13 state-protected plant species, two of which are federally protected. For a discussion of individual plant species, life history requirements, and habitat association, refer to the INRMP. Table 3-4 lists the protected plant species known to occur on APAFR. Figure 3-3 depicts the federally listed plant species on APAFR.

Table 3-4. List of Threatened or Endangered Plants Known to Occur on APAFR

Scientific Name	Common Name	State Listing Status	Federal Listing Status
Asclepias curtissii	Curtiss' Milkweed	E	N
Beltia purpurea	Pine-pink	T	N
Calopogon barbatus	Bearded Grass-pink	T	N
Calopogon multiflorus	Many-flower Grass-pink	E	MC
Campyloneurum phyllitidus	Long Strap Fern	E	N
Centrosema arenicola	Sand or Pineland Butterfly Pea	E	N
Clitoria fragrans	Pigeon-wing	E	T
Coelorachis tuberculosa	Piedmont or Florida Jointtail; Piedmont Jointgrass	T	MC
Encyclia tampensis	Tampa Butterfly Orchid	CE	N
Garberia heterophylla	Garberia	T	N

Table 3-4. List of Threatened or Endangered Plants Known to Occur on APAFR, Cont'd

Scientific Name	Common Name	State Listing Status	Federal Listing Status
Harrisella filiformis	Needle-root Airplant Orchid; Threadroot Orchid	T	N
Hartwrightia floridana	Florida Hartwrightia; Hartwrightia	T	N
Hypericum edisonianum	Edison's St. John's Wort; Edison't Ascyrum	E	MC
Lechea cernua	Nodding Pinweed; Scrub Pinweed	T	N
Lilium catesbaei	Catesby's or Pine or Southern Red Lily	T	N
Lycopodiella cernua	Nodding or Staghorn Clubmoss	CE	N
Matelea floridana	Florida Matelea; Florida Spiny-pod; Florida Milkvine	E	N
Ophioglossum palmatum	Hand Fern	E	N
Osmunda cinnamomea	Cinnamon Fern	CE	N
Osmunda regalis var. spectabilis	Royal Fern	CE	N
Panicum abscissum	Cutthroat Grass	E	MC
Pinguicula caerulea	Blue(-flower) Butterwort	T	N
Pinguicula lutea	Yellow Butterwort	T	N
Platanthera blephariglottis var.conspicua	White Fringe(d) Orchid	T	N
Platanthere ciliaris	Yellow-fringed Orchid	T	N
Platanthera cristata	Crested-fringed Orchid	T	N
Platanthera integra	Orange Rein-orchid; Yellow Fringeless Orchid	E	N
Platanthera nivea	Snowy or Snowy-orchid; Bog Torch	T	N
Pogonia ophioglossoides	Rose Pogonia; Snake-mouth Orchid	T	N
Polygonella basiramia	Hairy Jointweed; Wireweed	E	E
Pteroglossaspis ecristata	Wild Coco; Giant Orchid	T	MC
Rhynchospora megaplumosa	Hairy-spikelet Beakrush, Longbristle Beaksedge	E	N
Sarracenia minor	Hooded Pitcher-plant	T	N
Schizachyrium niveum	Scrub Bluestem	E	N
Spiranthes brevilabris var. floridana	Florida Ladies'-tresses	E	N
Spiranthes laciniata	Lace-lip Ladies'-tresses	T	N
Spiranthes longilabris	Giant Sprial Ladies'-tresses	T	N
Thelypteris serrate	Toothed Lattice-vein Fern	E	N
Tillandsia balbisiana	Wild Pine; Air Plant	T	N
Tillandsia fasciculata var. densispica	Wild Pine; Giant Air Plant	E	N
Tillandsia utriculata	Wild Pine; Spreading Air Plant	E	N
Vernonia blodgettii	Florida or Blodgett's Ironweed	E	N
Zephyranthes simpsonii	Rain-lily	T	N

Source: U.S. Air Force, 1997; FNAI, 2009
CE = Candidate for Endangered; E = Endangered; MC = Management Concern; N = Not listed; T = Threatened

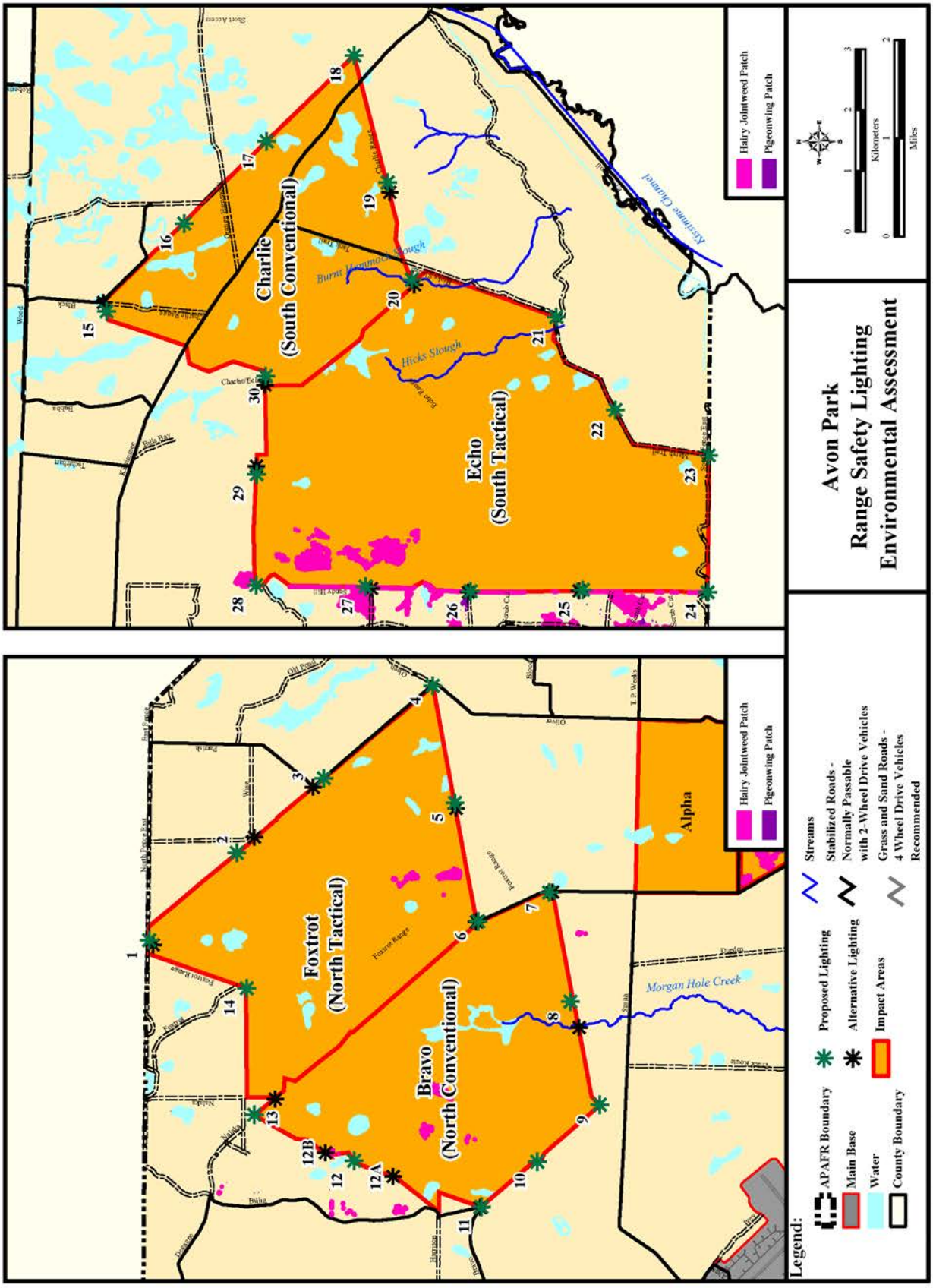


Figure 3-3. APAFR Federally Listed Plants

Protected Wildlife Species

APAFR is presently home to 15 state-protected wildlife species, 11 of which are also federally protected (Table 3-5). For a discussion of individual wildlife species, life history requirements, and habitat association, refer to the INRMP. A brief discussion on federally listed species on or near APAFR follows.

Table 3-5. Status of Wildlife Species On or Adjacent to APAFR

Common Name	Scientific Name	Federal Status	State Status
Birds			
Florida grasshopper sparrow	*Ammodramus savannarum floridanus*	E	E
Florida scrub jay	*Aphelocoma coerulescens*	T	T
Southeastern American kestrel	*Falco sparverius paulus*	N	T
Florida sandhill crane	*Grus canadensis pratensis*	N	T
Wood stork	*Mycteria americana*	E	E
Red-cockaded woodpecker	*Picoides borealis*	E	T
Audubon's crested caracara	*Polyborus plancus audubonii*	T	T
Snail kite[1]	*Rostrhamus sociabilis plumbeus*	E	E
Least tern	*Sterna antillarum*	N	T
Mammals			
Florida panther	*Puma concolor coryi*	E	E
Florida black bear	*Ursus americanus floridans*	N	T
Reptiles and Amphibians			
Eastern indigo snake	*Drymarchon corais couperi*	T	T
Blue-tailed mole skink[2]	*Eumeces egregious lividus*	T	T
Sand skink[2]	*Neoseps reynoldsi*	T	T

Source: U.S. Air Force, 1997; FNAI, 2009
C = Candidate for listing; E = Endangered; N = Not listed; T = Threatened
1. Species adjacent to but not documented on APAFR.
2. Species not documented on APAFR (Branch and Hokit, 2000).

Federally and State Protected Species

The APAFR natural resources staff has established Habitat Management Units (HMUs) for three species addressed in the *Plan for Management of the Florida Grasshopper Sparrow, Florida Scrub Jay, and Red-cockaded Woodpecker at Avon Park Air Force Range, Florida* (U.S. Air Force, 2000a). HMUs delineate areas both currently occupied and with the potential for occupation for the FGS, FSJ, and RCW. Figure 3-4 shows the RCW trees and the HMUs of the FGS and FSJ at APAFR.

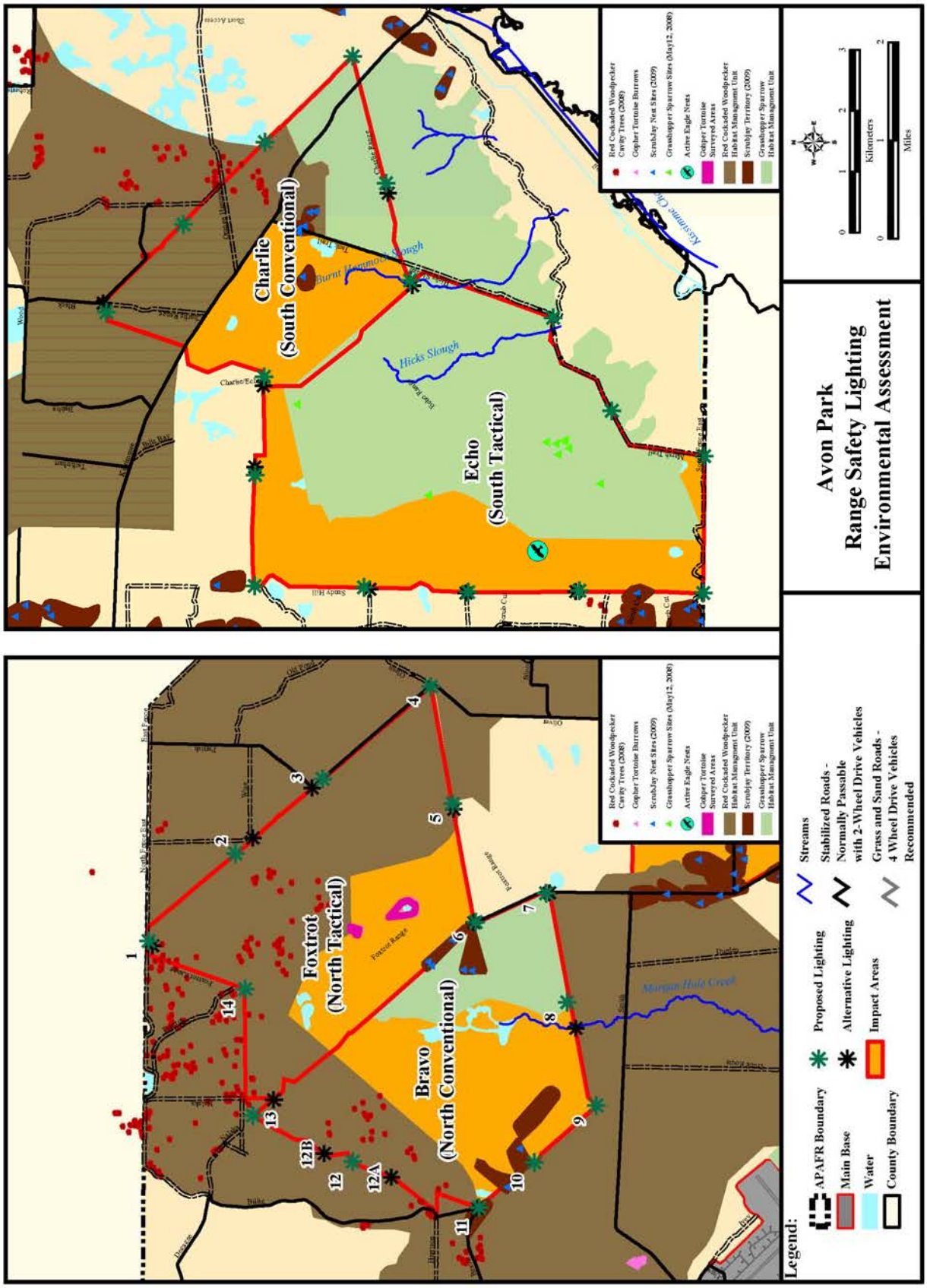


Figure 3-4. APAFR Protected Wildlife Species

Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*)

The FGS is federally and state-listed as endangered with loss of habitat the primary reason for population decline. The FGS is endemic to the south-central dry prairie region of the state. Native dry prairie is characterized as flat, treeless, fire-dependent grasslands with scattered shrubs (U.S. Air Force, 2000a). Since 1997 the FGS population has declined by over 93 percent from an estimate of 298 birds to 12 birds in 2009 (Tucker et al., 2008). Though small, the population of the FGS at APAFR has remained stable since 2003. However, because of its small size, the APAFR population is at risk of extinction and intensive management is required to ensure the continued existence of this species at APAFR (Tucker et al., 2008).

Suitable habitat is found along several locations of the range perimeter where the Proposed Action would occur. Figure 3-5 shows suitable habitat that was surveyed in 2007 but found to contain no FGS (Tucker et al., 2008).

Were it not for the very low numbers of FGS present at APAFR, tree removal within potential FGS habitat would likely have short-term beneficial impacts to this species. Sustained beneficial impacts would require a long-term management regime that includes restoration of dry prairie and examines the interactions between fire, grazing, and habitat structure/composition (Tucker et al., 2008).

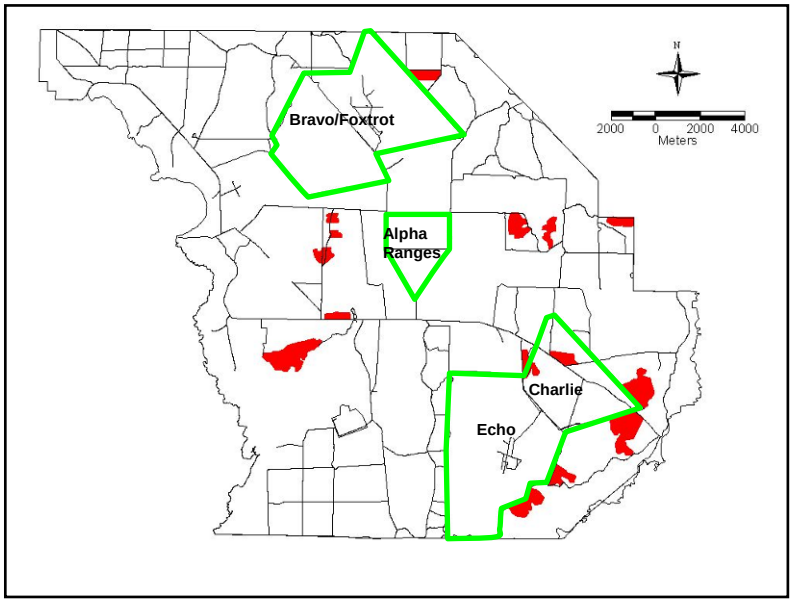


Figure 3-5. Suitable Habitat Surveyed in 2007 Apparently Not Occupied by Florida Grasshopper Sparrow

Florida Scrub Jay (*Aphelocoma coerulescens*)

The FSJ is federally and state-listed as threatened with population declines largely due to habitat loss from residential, commercial, and agricultural development. In addition to human activities, populations of FSJ are threatened due to natural occurrences as well. The primary cause of nest failure in the FSJ is predation which accounts for 67 percent of egg loss and 85 percent of nestling loss (Schaub et al., 1992). FSJ habitat is very specialized, consisting of fossil dune

ridges vegetated with xeric (subsisting on little water) oak scrub for nesting and foraging (Bowman et al., 2009). One such ridge, formed during the late Pleistocene, runs primarily north-south through the center of APAFR and supports four distinct regions of subpopulations of the FSJ.

The four regions of the FSJ at APAFR are identified as North Ridge, South Ridge, Isolated, and River. Two of these, the North Ridge and South Ridge populations are directly relevant to the project area, with stable habitat or territories located along some sections of range perimeters where lighting would be installed. Table 3-6 presents the most recent survey information for the subpopulations and identifies relevancy to the project area.

Table 3-6. Florida Scrub Jays by APAFR Survey Region for the April 2005 and 2006 Surveys

Survey Region	North Ridge	South Ridge	Isolated	River
Relevancy to Project Area	Stable FSJ territories along southwest **Bravo Range** Perimeter and **Bravo/Foxtrot Boundary**	Stable FSJ territories along southwest perimeter of **Echo Range**	None. This region does not occur along the perimeter of ranges where lights would be placed.	None. This region is located about 0.6 mile from perimeter where lights would be placed on Charlie Range.
Year: 2005				
Average # Groups	22	15	13	4
Average # Birds	44A/12Y	29A/16Y	25A/8Y	5A/5Y
Average Group Size	2.5	3.0	2.5	2.5
Year: 2006				
Mean # Groups	22	15	12	4
# Birds	46A/8Y	29A/8Y	28A/6Y	11A/1Y
Average Group Size	2.5	2.5	2.8	3.0

Source: Bowman et al., 2009
A=Adult; Y = Yearling
Grouped years represent the mean number of groups, mean number of birds, and mean group size of all the years combined.

Red-cockaded Woodpecker (*Picoides borealis*)

The RCW is federally listed as endangered and state-listed as threatened. The RCW has a black cap, black nape, and a mostly black and white barred back. Males have a red patch behind the eye. RCWs inhabit open, mature pine forest in the southeastern United States and prefer to nest in mature longleaf pines. RCW populations at APAFR are considered stable, being relatively unchanged from 1970s populations. Clusters are spread over the entire range with concentrated areas in the north–central/northwest, northeastern, and eastern part of the range (U.S. Air Force, 2000a).

As of a July 2008 census, there were 38 "managed" clusters at APAFR that supported 27 RCW groups. By USFWS definition, "managed" clusters are either "active or inactive natural or recruitment clusters that supported at least four cavities in good condition," providing suitable conditions for occupancy in the previous year. "Unmanaged" clusters lack suitable trees, are highly isolated, unlikely to be reoccupied and do not warrant the time and materials necessary to

maintain cavities for RCW occupancy (Bowman et al., 2009a). Nine of the managed clusters were inactive in 2008, and 18 were deemed unsuitable for occupancy because they did not have acceptable cavities in living trees. In the River Ranch subdivision, along the north border of the Foxtrot Range, there were four active clusters and 14 inactive clusters in 2008. The territory of one of the clusters at River Ranch Acres, cluster AP19, spans both APAFR and River Ranch Acres. With regard to the Proposed Action, the Foxtrot Range perimeter, particularly the north area between APAFR and River Ranch acres, supports several RCW active and inactive clusters (Figure 3-6). An active recruitment area and active clusters are located near the west Bravo perimeter, though not directly on it. There are two unsuitable recruitment clusters and one inactive cluster along the Charlie Range east perimeter. An active cluster is located approximately 0.25 mile from the Charlie Range east perimeter.

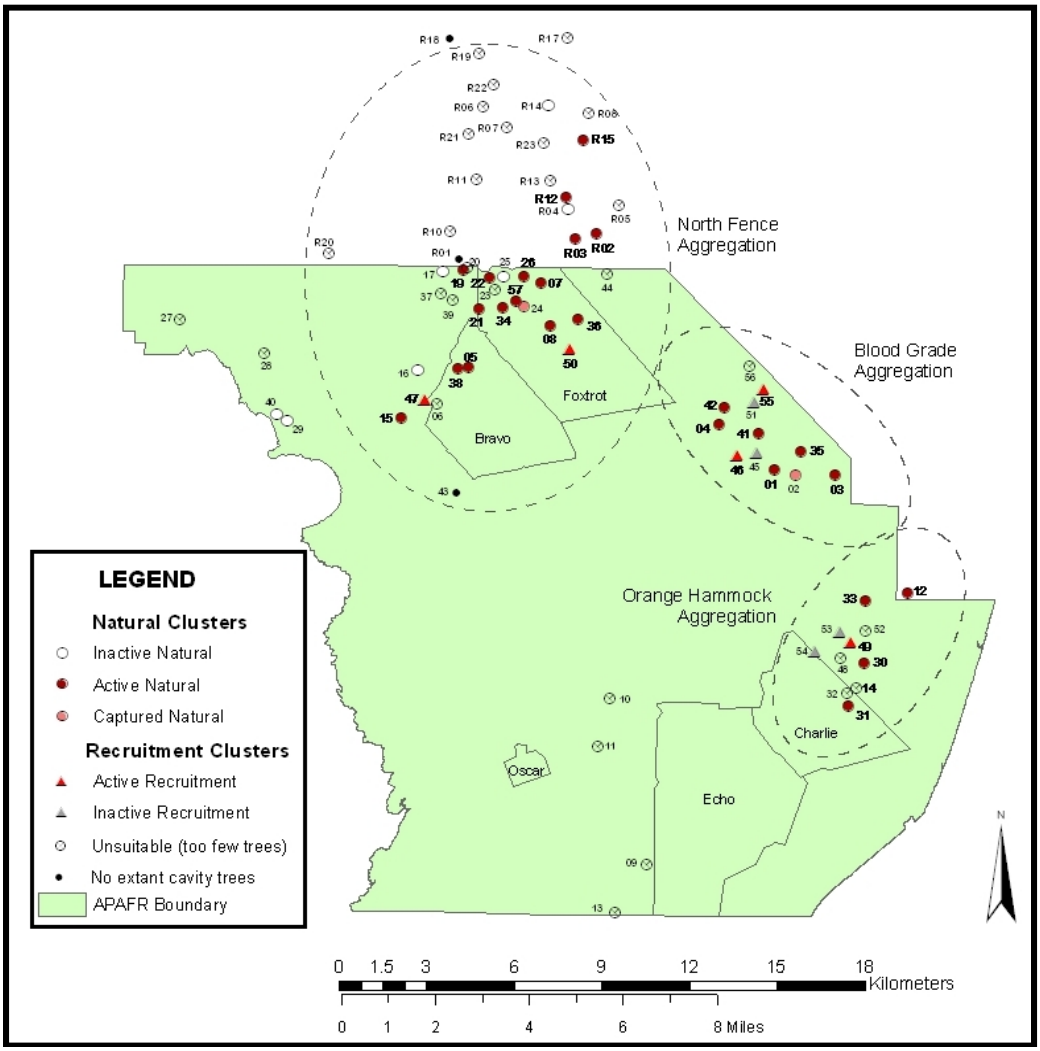


Figure 3-6. Red-cockaded Woodpecker Clusters at APAFR (2008 survey)
Source: Bowman et al., 2009a

Unsuitable RCW occupancy areas generally include habitats such as sloughs, wetlands or scrub, or soil/drainage areas. In some cases, unsuitable habitat may also include flatwoods areas that have been altered by silviculture or habitat management operations. The various phases of APAFR vegetation management, such as tree harvesting and replanting and prescribed burning,

have a direct bearing on the RCW habitat suitability of a given management area. RCW habitat availability will change as the temporary effects of tree removal or wildfire damage are amended by the recovery of affected flatwoods ecosystems. Flatwoods areas managed with prescribed burning (areas are typically burned every 3 years) generally improves the availability of suitable RCW habitat.

Wood Stork (*Mycteria americanus*)

The wood stork is federally and state-listed as endangered with low reproductive success blamed for population declines. Alterations to quality feeding habitat are most likely linked with low reproductive success and the decline of this species in Florida where 35 percent of formerly used habitat is no longer suitable for the wood stork (U.S. Navy, 2005). Wood storks have been observed throughout APAFR, presumably to forage, but are not known to nest there (U.S. Navy, 2005).

Audubon's Crested Caracara (*Caracara cheriway*)

The crested caracara is an osprey-sized bird federally and state-listed as threatened. The crested caracara has a large head with a large bluish bill and red-orange bare facial skin, a white throat, a long whitish neck, and long yellowish legs. The bird is blackish brown overall with white patches showing at the end of the wings in flight. Loss of habitat is blamed for species declines. Crested caracaras are occasionally sighted at APAFR (U.S. Navy, 2005).

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is a large raptor that has been protected in the United States since the Bald Eagle Protection Act of 1940 (16 USC 668). The bald eagle was federally and state listed, but due to a dramatic recovery in population, was removed from the list on June 28, 2007. Recent estimates suggest that more than 10,000 nesting pairs of bald eagles exist, which would represent a 25 fold increase in population (U.S. DOI, 2007). Adult birds are mostly dark brown with a white tail and head and a large yellow bill and yellow feet. Bald eagles frequent APAFR, and there are three nesting locations shown in Figure 3-4. None of the nesting locations are located on or near the perimeter of the ranges where the RSLS would be installed. There is one active bald eagle nest located inside Echo range approximately one mile from lights #25 and #26, equal distance between the two lights.

Florida Snail Kite (*Rostrhamus sociabilis plumbeus*)

The Florida snail kite or Everglades snail kite is a medium-sized hawk federally and state-listed as endangered. Adult males are slate black to gray with a sharply hooked bill and a white patch above and below the upper tail. Adult females are similarly colored with some streaking on the breast and some white on the forehead and throat. No known population of Florida snail kites occurs at APAFR. Snail kites may pass through or near APAFR, traveling between large habitat areas to the north or south (the Everglades, for example) of APAFR (U.S. Navy, 2005).

Florida Panther (*Puma concolor coryi*)

The Florida panther is a federally and state-listed endangered species. Loss of habitat is the main reason for the population decline (U.S. Navy, 2005). A two-day survey for panther signs (tracks,

scat, and so forth) did not find evidence of the species currently at APAFR. However, one Florida panther was witnessed and photo documented on APAFR during 2009 by a recreational hunter. Counties bordering opposite areas of APAFR have verified sightings or signs of the Florida panther (Land et al., 2004).

Eastern Indigo Snake (*Drymarchon corais couperi*)

The eastern indigo snake is federally and state-listed as threatened. This snake attains lengths up to 8.5 feet, is blue-black in coloration and is nonpoisonous. Indigo snakes are known to use gopher tortoise burrows to escape weather extremes. Loss of habitat and decline in gopher tortoise populations are the leading causes in the decline of eastern indigo snake populations. Approximately 50,000 acres of APAFR are upland communities serving as potential habitat to the eastern indigo snake. These communities include oak scrub, pine plantation, oak hammock, pine flatwoods, sand pine scrub, dry prairie, hardwood swamp, wetlands, and disturbed areas. Several sightings have occurred on or near roads (Bridges, 2004). Prior to prescribed fire, thinning or clear-cuts, APAFR personnel conduct a gopher tortoise survey to determine the possible presence of the indigo snake.

Sand Skink (*Neoseps reynoldsi*)

The sand skink, a burrowing lizard, is federally and state-listed as threatened. Despite intensive sampling, this species has not been documented at APAFR but occurs in adjacent counties (Branch and Hokit, 2000).

Bluetail Mole Skink (*Eumeces egregious lividus*)

The bluetail mole skink is federally and state listed as threatened. Like the sand skink, intensive sampling efforts have not yielded any documented occurrences of this species at APAFR, but this skink may occur nearby (Branch and Hokit, 2000).

Highlands Tiger Beetle (*Cicindela highlandensis*)

The Highlands tiger beetle is a candidate for listing as threatened or endangered by the USFWS. Though this species has not been documented at APAFR, its presence has been documented in Highlands and Polk Counties (U.S. Navy, 2005).

Migratory Birds

Migratory birds are protected by the *Migratory Bird Treaty Act* (1918, 16 USC Section 703, et seq.) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (2001). The Migratory Bird Treaty Act makes it unlawful to kill, capture, collect, possess, buy, sell, ship, import or export listed bird species including their parts, nests or eggs, unless an appropriate federal permit is obtained. Under EO 13186, federal agencies are required within permitted law, availability of monies, budgetary limits and agency missions to:

- Support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities, and by avoiding or minimizing adverse impacts on migratory bird resources.

- Prevent or abate pollution or detrimental alteration of the environment for the benefit of migratory birds.
- Design migratory bird habitat and population conservation principles, measures, and practices into agency plans and planning processes, and coordinate with other agencies and nonfederal partners in planning efforts.
- Provide notice to the USFWS in advance of conducting an action that is intended to take migratory birds.
- Minimize the intentional take of species of concern.
- Identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations.

Currently, the DoD is exempt from having to obtain permits for incidental takes of migratory birds for military readiness activities (Bearden, 2005). The exemption was granted per the 2003 National Defense Authorization Act (NDAA) until regulations for the issuance of permits for incidental takings of migratory birds during military training exercises are finalized (Bearden, 2005). The Secretary of the Interior is developing the regulations as directed by the NDAA.

APAFR is located under the migratory pathway, the Atlantic flyway. Therefore, migratory waterfowl may be attracted to surface water and wetland habitats on or near the range. Major water bodies in the study area include Lake Arbuckle, Arbuckle Creek, and the Kissimmee River. Numerous swamps and marshes throughout the area also provide aquatic habitat. There are two normal migratory seasons: fall and spring.

Invasive and Exotic Species

The State of Florida has one of the highest numbers of introduced or nonnative species in the country, primarily because of its subtropical climate and isolated topography (FDEP, 2004). Approximately 10 percent of the thousands of nonnative plant species in Florida are considered "invasive," threatening to displace natural species or altering habitat processes such as water flow or fire susceptibility (FDEP, 2004).

EO 11312 requires federal agencies to identify actions that may affect the status of invasive species and to use appropriate programs and authorities to:

- Prevent invasive species introductions.
- Detect populations of invasive species and rapidly institute cost-effective and environmentally sound control measures.
- Monitor invasive species populations.
- Restore native species and habitat conditions in areas that have been invaded.
- Conduct research and develop technologies to prevent introduction of and control spread of invasive species.
- Promote public awareness of invasive species and the means to address them.

The order also states that federal agencies are not to authorize, fund, or carry out actions that are likely to promote the introduction or spread of invasive species unless the agency has made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species and that all reasonable measures to minimize risk of harm will be taken in conjunction with the actions.

The FDEP is responsible for the control of invasive exotic species on public conservation lands as directed in Florida Statutes 369.252.

Several invasive plant and animal species occur at APAFR, though the coverage of these species is low compared to the rest of central Florida, primarily attributable to the lower human disturbance at APAFR. Invasive and exotic plants occurring at APAFR are presented in Table 3-7 by category. Category I consists of invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. Invasive exotics that have increased in abundance or frequency, but have not yet altered Florida plant communities to the extent shown by Category I species, are placed in Category II.

Table 3-7. Invasive and Exotic Plant Species Found at APAFR

Scientific Name	Common Name
Category I	
Casuarina glauca	Australian pine
Dioscorea bulbifera	Air potato
Eichhornia crassipes	Water hyacinth
Eugenia uniflora	Surinam cherry
Hydrilla verticillata	Hydrilla
Hymenachne amplexicaulis	West Indian marsh grass
Imperata cylindrica	Cogon grass
Lantana camara	Lantana
Ligustrum sinense	Chinese privet
Lygodium japonicum	Japanese climbing fern
Lygodium microphyllum	Old World climbing fern
Macfadyena unguis-cati	Cat's claw vine
Melaleuca quinquenervia	Melaleuca
Nephrolepis multiflora	Asian sword fern
Panicum repens	Torpedo grass
Pistia stratiotes	Water lettuce
Psidium cattleianum	Strawberry guava
Rhodomyrtus tomentosa	Downy rose myrtle
Ruellia brittoniana	Mexican petunia
Schinus terebinthifolius	Brazilian pepper
Solanum viarum	Tropical soda apple
Syngonium podophyllum	Arrowhead vine
Tradescantia spathacea	Oyster plant
Urochloa mutica	Para grass
Category II	
Alternanthera philoxeroides	Alligator weed
Limnophila sessiliflora	Asian marsh weed
Phoenix reclinata	Senegal date palm
Pteris vittata	Chinese ladder brake fern
Rhynchelytrum repens	Natal grass

Table 3-7. Invasive and Exotic Plant Species Found at APAFR, Cont'd

Scientific Name	Common Name
Sansevieria hyacinthoides	Bowstring hemp
Urena lobata	Caesar weed
Xanthosoma sagittifolium	Elephant ear

Source: U.S. Air Force, 1997

Nuisance and Exotic Animal Species

Maintenance programs for native ecological systems at APAFR prevent the widespread establishment of nuisance or exotic animal species. Feral (i.e., wild) hogs are probably the most common nonnative mammal species at APAFR and are controlled through hunting or trapping (U.S. Navy, 2005). The Cuban treefrog (*Osteophilus septentrionalis*), Cuban brown anole (*Anole sagrei*) and the Indo-Pacific gecko (*Hemidactylus garnoti*) are some amphibian and reptile species that occur within the built up areas of APAFR (U.S. Navy, 2005).

3.4 ANTHROPOGENIC RESOURCES

3.4.1 Definition of the Resource

This section refers to changes in ecological integrity and to changes in the human value of a natural area that occurs from human activities. In particular, this section is concerned with the affects to the night skies at the Florida Kissimmee Prairie Preserve (FKPP) and with the potential impacts to the number of visitors seeking stargazing activities at the park.

3.4.2 Existing Conditions

Located approximately seven miles east of APAFR is the FKPP. The preserve covers 54,000 acres, making it one of the largest remaining stretches of Florida dry prairie. The state park has over 100 miles of dirt trails and therefore is a popular area for outdoor activities including hiking, horseback riding, bird watching, and camping. Due to the park's large size and remote area, it is also a popular place for stargazing, because there are few urban lights that impact the dark sky (StateParks.com, 2009). Entrance fees into the park depend on type of activity individuals seek at the park (Table 3-8).

Table 3-8. Florida Kissimmee Prairie Preserve Park Fees

Type	Fee ($)
Admission Fee	
Per vehicle	4.00
Pedestrian, bicyclists	2.00
Camping Fees	
Standard Campsite (per night)	16.00
Adult Primitive Campsite	5.00
Child Primitive Campsite	1.00
Equestrian Fees	
Individual Equestrian (per day)	7.00
Family Equestrian (8 people max; per day)	15.00

Source: Florida Division of Recreation and Parks, 2008

Over the past 5 years, the preserve has had 66,107 visitors. Over 61 percent of the total visitors during that period have been overnight visitors, while the remaining 39 percent have been daytime visitors. On average, approximately 13,220 individuals visit the site per year (Table 3-9) with the majority of visits recorded for overnight stays (Reynolds, 2009). However, the number of daytime visitors has significantly increased over the past year and has surpassed the number of overnight visitors. The most popular times to visit the park are January through March, on the weekends, and during holidays and special events (Table 3-10 and Table 3-11). The seasonal variation in visitors is highly related to weather conditions, when the temperatures are cooler. In particular for astronomers, the moisture in the air during the humid summer months diffuses the light, making it difficult to see past the layer of moisture in the sky (Brown, 2009). The number of visitors to the park, particularly astronomers, is also highly influenced by major astronomical events or new moon nights, (Brown, 2009) which occur every 29.5 days.

Table 3-9. Total Visitors to the Florida Kissimmee Prairie Preserve

Fiscal Year (FY)*	Total Number of Visitors		
	Overnight	Daytime	Total
FY 04 - 05	7,442	5,432	12,874
FY 05 - 06	5,720	3,087	8,807
FY 06 – 07	7,757	2,166	9,923
FY 07 – 08	9,243	2,655	11,898
FY 08 - 09	10,213	12,392	22,605
Total	40,375	25,732	66,107

Source: Reynolds, 2009
*FY is from July to June

Table 3-10. Total Number of Visitors to the Florida Kissimmee Prairie Preserve by Month, Fiscal Years 04–09

Month	Total Number of Visitors		
	Overnight	Daytime	Total
January	6,924	3,433	10,357
February	7,119	3,533	10,652
March	7,247	3,746	10,993
April	4,733	3,326	8,059
May	2,166	2,199	4,365
June	736	1,355	2,091
July	712	902	1,614
August	358	869	1,227
September	676	753	1,429
October	1,235	1,043	2,278
November	4,388	2,410	6,798
December	4,081	2,163	6,244
Total	40,375	25,732	66,107

Source: Reynolds, 2009

Table 3-11. Total Visitors to the Florida Kissimmee Prairie Preserve by Day, Fiscal Years 04–09

Month	Total Number of Visitors		
	Overnight	Daytime	Total
Sunday	5,586	4,637	10,223
Monday	3,272	2,217	5,489
Tuesday	3,069	2,338	5,407
Wednesday	3,365	2,550	5,915
Thursday	4,374	3,129	7,503
Friday	9,693	4,462	14,155
Saturday	11,016	6,399	17,415
Total	40,375	25,732	66,107

Source: Reynolds, 2009

Based on images of North America from The World Atlas of the Artificial Night Sky Brightness, the FKPP is designated as a blue area, or a "Class 3," according to the Bortle Scale, a light pollution scale developed by John Bortle (Figure 3-7). APAFR is currently in the yellow area, or a "Class 4," according to the Bortle Scale (Figure 3-7). Descriptions of the Bortle Scale are color coded and described in Table 3-12.

Table 3-12. Artificial Night Sky Brightness Using the Bortle Scale

Color	Artificial/Natural Sky Brightness	Bortle Class	Description
Black	<0.01	1	Excellent Dark Sky – The zodiacal light, gegenschein (counter-glow from the sun reflecting off space particles), and zodiacal band are all visible
Grey	0.01 to 0.11	2	Typical Truly Dark Sky – Airglow might be weakly apparent along the horizon
Blue	0.11 to 0.33	3	Rural Sky – Some indication of light pollution along the horizon is evident
Green	0.33 to 1.0	4	Rural/Suburban Transition – Fairly obvious light-pollution domes are apparent over population centers in certain directions
Yellow	1.0 to 3.0	4.5	Suburban Sky – Light sources are evident in most if not all directions
Orange	3.0 to 9.0	5	Bright Suburban Sky – No trace of the zodiacal light can be seen; clouds appear bright
Red	9.0 to 27.0	6.7	Suburban/Urban Transition – Entire sky background has a vague, grayish white hue
White	>27.0	8.9	City Sky – The sky glows whitish gray or orangish; text is read without difficulty Inner City Sky – The entire sky is brightly lit

Source: Danko, 2009; Northern Virginia Astronomy Club (NOVAC), 2009
< = less than; > = greater than

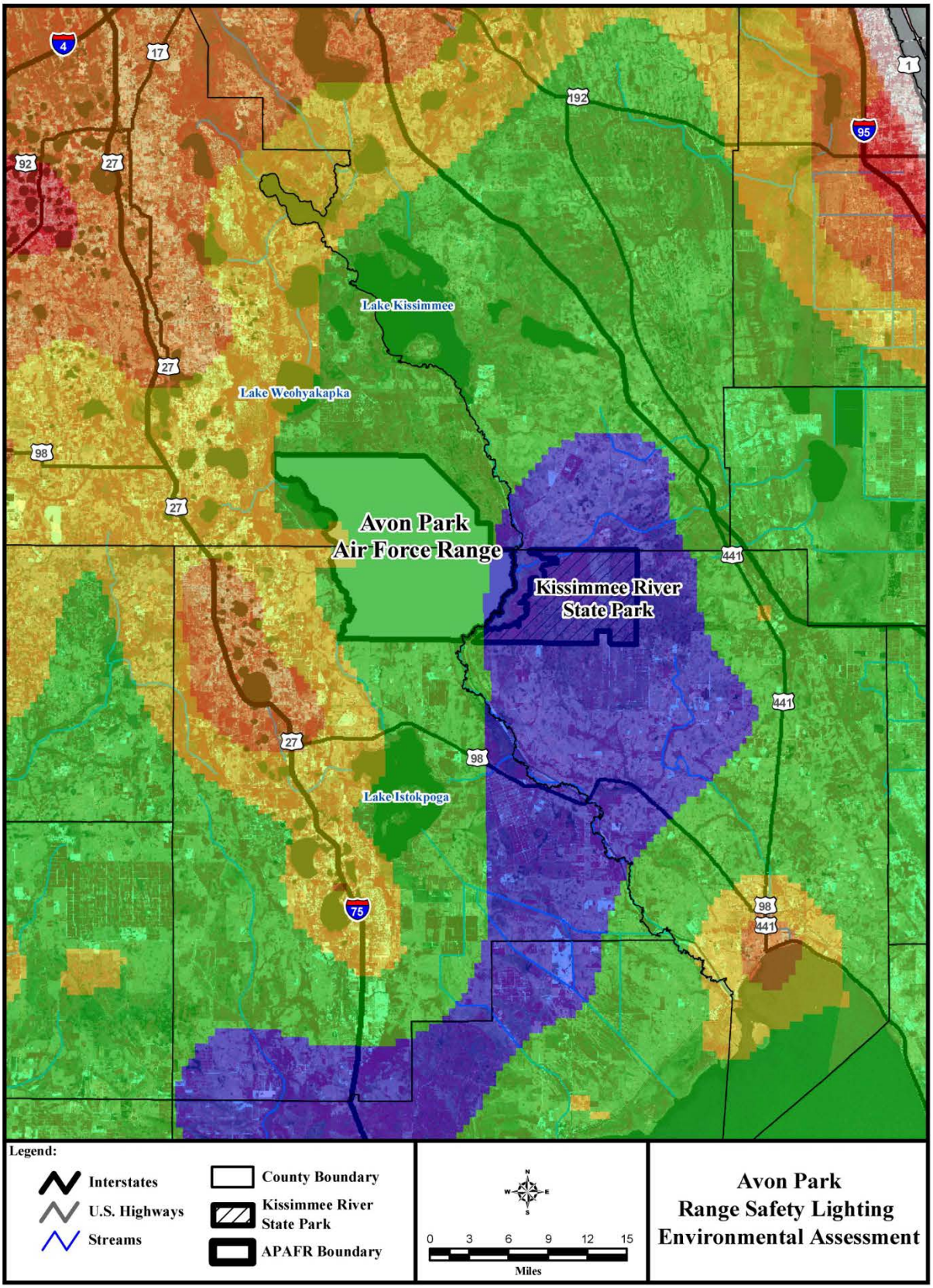


Figure 3-7. Existing Artificial Night Sky Brightness Using the Bortle Scale (Table 3-1)
(Danko, 2009; Northern Virginia Astronomy Club (NOVAC), 2009)

3.5 CULTURAL RESOURCES

3.5.1 Definition of the Resource

Cultural resources consist of prehistoric and historic sites, structures, artifacts, and any other physical or traditional evidence of human activity considered relevant to a particular culture or community for scientific, traditional, religious, or other reasons. As defined under 32 CFR 800 (l)(1), "Historic Property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria."

The alternative-specific Cultural Resources sections within this EA describe known historic properties within the affected areas that are potentially eligible for the NRHP. This includes any archaeological resources considered eligible, potentially eligible, or currently listed on the NRHP. This may also include historic structures, historic districts, any of the known eligible historic cemeteries, or traditional cultural properties (TCPs).

For the purpose of this document, cultural resources, with a description of their state of investigation and condition, are presented for analysis as they intersect with the Area of Potential Effect (APE) created by the undertaking. As defined under 36 CFR 800.16(d), "the Area of Potential Effects is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking." The APE for this project is assumed not to extend beyond the footprint of the project boundaries as defined under each alternative area.

Properties identified in the APE by the Air Force are evaluated according to the NRHP criteria, in consultation with the SHPO and other parties. Typically, if the SHPO and other parties and the Air Force agree in writing that a historic property is eligible or not eligible for listing on the NRHP, that judgment is sufficient for Section 106 purposes (36 CFR 800.4[c][2]). Procedures and criteria for this can be found in 36 CFR 63, *Determinations of Eligibility for Inclusion in the National Register of Historic Places* and in APAFR's *Integrated Cultural Resource Management Plan* (APAFR, 2008).

3.5.2 Existing Conditions

Four historic structures are considered eligible for listing on the NRHP at APAFR, while 13 additional structures are regarded as potentially NRHP eligible. No historic structures or buildings fall within the APE for this project (APAFR, 2008).

There are no identified TCPs on APAFR associated with American Indian traditions or beliefs, and no specific studies have been conducted to identify TCPs (APAFR, 2008). One Euro-American traditional cultural resource, Fort Kissimmee Cemetery, is associated with the earliest Euro-American settlers of the region. After the Third Seminole War, Fort Kissimmee was populated by American settlers. These settlers remained at the Town of Fort Kissimmee

until APAFR was created in 1941. After APAFR was created, they retained in-common ownership of a cemetery at Fort Kissimmee that they had used since permanently settling the area. The members of the Fort Kissimmee Cemetery Association retain ownership of the parcel of land containing the cemetery, as well as a small piece of property that extends to the Kissimmee River. The association, in coordination with Range Operations Flight is granted access to the cemetery in the event of a funeral (APAFR, 2008). No TCPs fall within the APE for this project.

APAFR utilizes an archaeological probability model which is used to identify areas with a high potential for cultural resources (APAFR GIS, 2009). APAFR maintains maps depicting areas of low, medium, and high probabilities for the presence of cultural resources. Within the 30 proposed light placement locations under each alternative, six placements (site locations 13 and 24 through 28) intersect areas of cultural resource concern. Twenty-four of the proposed and alternative locations have been previously surveyed for cultural resources and were identified as having no archaeological sites or historic structures present in immediate vicinity (Table 3-13).

Eighteen archaeological surveys have been conducted within the boundaries of APAFR since 1983. A total of 49,331 acres has been systematically surveyed, equaling 46.5 percent of the total acreage of the Range. Nine archaeological surveys were conducted at APAFR between 1983 and 1998. A total of 98 prehistoric archaeological sites, 44 historic archaeological sites, and 10 multi-component prehistoric and historic archaeological sites have been identified. Currently, no resources on APAFR are NRHP-listed (U.S. Air Force, 2006; APAFR, 2008; NRIS, 2009).

Table 3-13. Cultural Resources Located in Proximity to Lighting Feature Locations

Proposed Action Light Location	Alternative 1 Light Location	Proposed Action Cultural Resource Concerns	Alternative 1 Cultural Resource Concerns
1	Same location as proposed	Area *not previously* surveyed*****.	
2		Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.	
3		Area *not previously* surveyed.	
4	NA	Area *not previously* surveyed.	NA
5	Same location as proposed	Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.	
6		Area *not previously* surveyed.	Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.
7			
8		Area *not previously* surveyed.	
9			
10	Light on existing tower	Area *not previously* surveyed.	Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.
11	Same location as proposed	Area *not previously* surveyed.	

Table 3-13. Cultural Resources Located in Proximity to Lighting Feature Locations, Cont'd

Proposed Action Light Location	Alternative 1 Light Location	Proposed Action Cultural Resource Concerns	Alternative 1 Cultural Resource Concerns
12	12A	Area *not previously* surveyed.	Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.
NA	12B	NA	Area *previously* surveyed.
Proposed Action Light Location	Alternative 1 Light Location	Proposed Action Cultural Resource Concerns	Alternative 1 Cultural Resource Concerns
13	Same location as proposed	Area *not previously* surveyed; ***cultural resource concerns*** in this project location.	
14		Area *not previously* surveyed.	
15			
16			
17			
18		Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.	
19			
20		Area *not previously* surveyed.	
21			
22		Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.	
23	NA	Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.	NA
24	Same location as proposed	Area *not previously* surveyed; ***cultural resource concerns*** in this project location.	
25		Area *previously* surveyed; ***cultural resource concerns*** in this project location.	Area *not previously* surveyed; ***cultural resource concerns*** in this project location.
26		Area *not previously* surveyed; ***cultural resource concerns*** in this project location.	
27		Area *previously* surveyed; ***cultural resource concerns*** in this project location.	
28			
29	37	Area *previously* surveyed; no archaeological sites or historic structures present in immediate vicinity.	Area *not previously* surveyed.
30	Same location as proposed	Area *not previously* surveyed.	
*Areas not previously surveyed******. This designation identifies locations where additional cultural surveys may be required to determine the presence of potential cultural resource features (See Section 6.0, Management Practices).			

3.6 SOIL RESOURCES

This section provides an inventory of the earth resources within the Proposed Action north (Foxtrot/Bravo) and south (Charlie/Echo) ranges. Specific soils information presented in the following sections includes soil types, soil moisture, and soil water tables. APAFR soils data is expressed using affected range acre metrics and spatially defined using GIS maps.

3.6.1 Definition of the Resource

Soil Types

Soils are classified according to the U.S. Department of Agriculture's National Cooperative Soil Survey classification which includes soil order, suborder, great group, subgroup, family, and series. Soil orders are the most general classification, providing very broad soil information on a small spatial scale, whereas soil series provide detailed data on a large spatial scale including series descriptions, taxonomic class, typical soil horizons, range of characteristics, geographic setting, drainage, soil water, vegetation, and other features. Soil series provide trends and range of conditions that are common to a soil. Although soil series descriptions provide a fine level of detail, a range of variability may occur for site-specific soils.

Soil Erosion

Soil erosion is a three-phase process of detachment, transport, and deposition of surface materials by water overland flow. Soil erosion is difficult to control and easily accelerated by humans. Accelerated erosion caused by humans occurs at rates much greater than under natural erosion conditions and has detrimental effects on soils and ecosystems. Soil is a nonrenewable resource. In the absence of intervention, the loss of soil through accelerated erosion can be equated to a possible permanent loss of soil productivity. Eroded soil particles moved and deposited by water are known as sediment, which once deposited in waterways can result in sedimentation and turbidity. Soil erosion is associated with three major types of environmental damage: reduced land productivity, water pollution, and ecosystem habitat degradation. Human-induced soil disturbances, whether minor, transitory, or drastic, generally determine the kind and extent of environmental effects. Soil environments impacted by erosion may take decades or centuries to recover.

Soil Moisture

Soil moisture is a primary limiting factor that determines the form and function of APAFR ecosystems. The moisture content of soil horizons varies with the seasons; a soil may be continuously moist in all or some horizons throughout the year or for part of the year. Changes in soil moisture can alter the vegetation composition of ecosystems and subsequently, the availability of wildlife habitats. Soil moisture content is based on the presence of hydric soil regimes.

A hydric soil is a soil formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are typically anaerobic (lacking oxygen) because of frequent durations of water saturation, inundation, or both, for periods that exceed a few days. Based on fluctuations in surface (flooding and ponding) and subsurface (water table) hydrology, some hydric soils may have non-hydric phases. Water table fluctuations can have a significant effect on the hydrologic regime of ecosystems.

Water Table

The water table is generally defined as the upper surface of the saturated zone. Soil water tables are extremely dynamic features and exhibit wide and diverse fluctuations. Seasonal fluctuations

within some soils may exceed several feet. Generally well-drained soils have shorter periods of high water table levels and longer periods of low water table levels than poorly drained soils. The seasonal high water table (SHWT) is the shallowest depth of free water that stands in an unlined borehole or where the soil moisture tension is zero for more than a few weeks.

SHWT depth estimates are based on the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) published soil survey data (U.S. Department of Agriculture, 2003). The NRCS data provide range estimates of seasonal high water table depths; however, there is an understanding that site-specific data can be quite variable.

3.6.2 Existing Conditions

Soil Type

For this earth resources inventory, soils data for the north and south ranges are presented at the soil order (Table 3-14 and Figure 3-8) and soil series (Table 3-15) classification levels.

Table 3-14. North and South Range Soil Orders

Soil Order	Avon Park Ranges (acres)				Total
	North Ranges		South Ranges		
	Bravo	Foxtrot	Charlie	Echo	
Alfisols	0	0	186	2	188
Entisols	481	765	2,418	238	3,901
Histosols	98	114	189	74	475
Inceptisols	134	299	237	25	695
Mollisols	0	0	0	8	8
Spodisols	3,130	2,348	3,959	4,014	13,451
Blank	21	0	0	14	35
Total	3,864	3,526	6,989	4,374	18,754

As shown in Table 3-14, spodisols (72 percent) and entisols (21 percent) comprise approximately 92 percent of the north and south ranges. Alfisols (1 percent) and mollisols (less than 1 percent) account for the lowest soil order total range acres.

Soil Erosion

Because of the relative flatness of the terrain and dominance of native vegetative cover, soil erosion by water or wind is not a major issue for APAFR (U.S. Air Force, 2006). In instances where localized human disturbances remove vegetation and expose bare soil, rainsplash and sheet erosion may impair the water quality and degrade the habitats of adjacent ecosystems. Unpaved roads and crossings are more prominent potential sources of APAFR soil erosion and sedimentation. Unpaved road trafficking and maintenance frequently produce loose roadway surface soils that are easily dislodged and transported by storm water runoff. However, eroded materials often accumulate in relatively close proximity to the source because of gentle slope gradients and low energy water flow conditions.

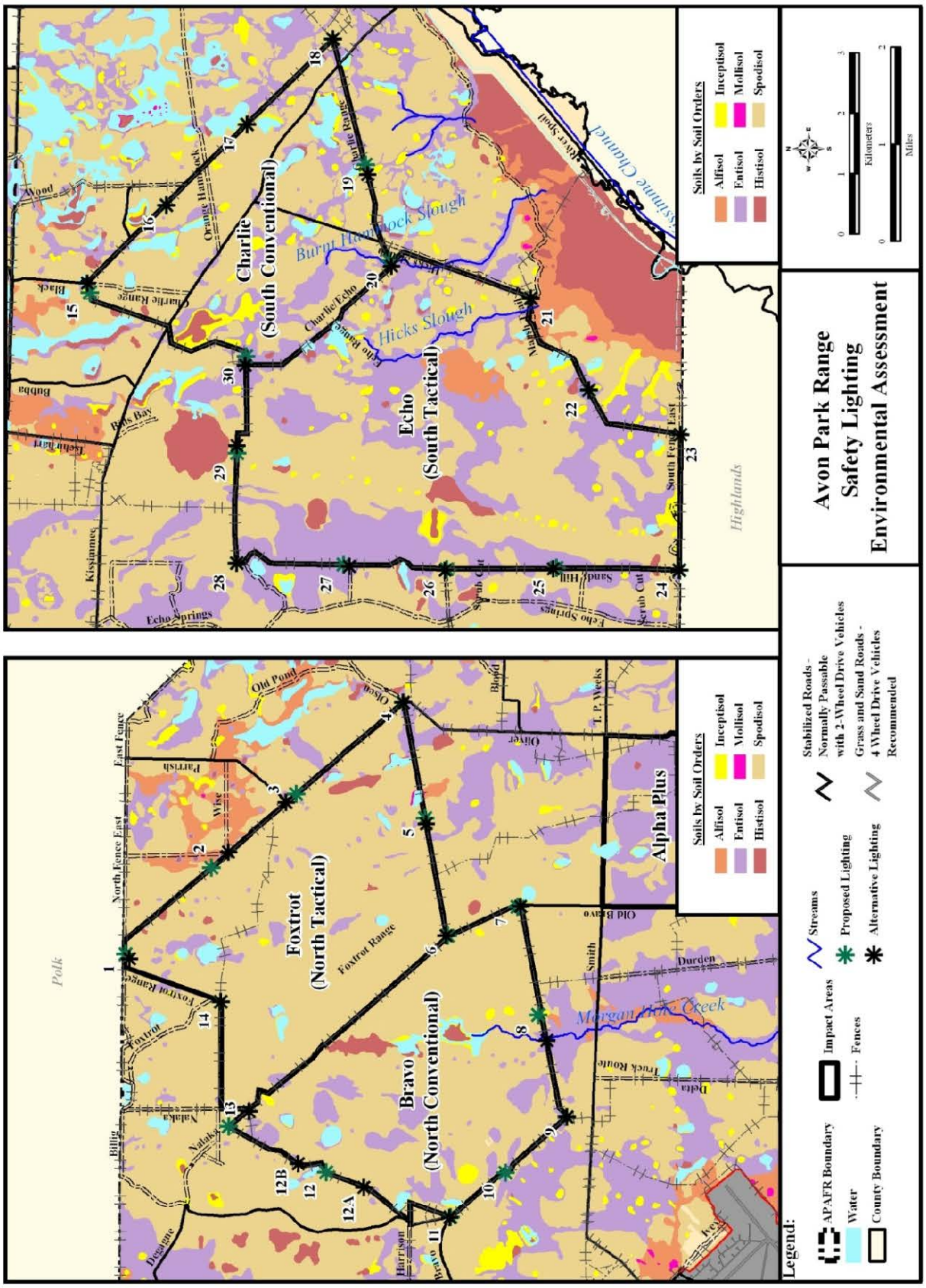


Figure 3-8. North and South Ranges Soil Orders

Table 3-15. North and South Range Soil Series

Soil Series	Avon Park Ranges (acres)				Total
	North Ranges		South Ranges		
	Bravo	Foxtrot	Charlie	Echo	
Alfisols					
Felda Sand*	0	0	0	2	2
Felda Sand, Depression*	0	0	0	6	6
Malabar Sand*	0	2	0	176	178
Malabar Sand, Depression*	0	0	0	2	2
Total	0	2	0	186	188
Entisols					
Archbold Sand	0	22	0	436	458
Basinger Sand*	65	30	390	1,225	1,710
Basinger Sand, Depression*	48	78	80	33	239
Satellite Sand	356	102	0	418	876
Valkaria Sand*	11	6	295	306	618
Total	480	238	765	2,418	3,901
Histosols					
Hontoon Muck*	0	40	0	122	162
Samsula Muck*	98	34	114	67	313
Total	98	74	114	189	475
Inceptisols					
Placid Sand, Depression*	134	25	87	124	370
Sanibel Muck*	0	0	212	113	325
Total	134	25	299	237	695
Mollisols					
Floridana Mucky Sand, Depression*	0	8	0	0	8
Total	0	8	0	0	8
Spodisols					
Daytona Sand	0	0	0	60	60
Duette Sand	85	0	0	0	85
Eau Gallie Sand*	0	0	0	30	30
Immokkalee Sand*	102	91	246	313	752
Myakka Sand*	1,832	2,388	2,024	2,319	8,562
Narcoossee Sand	61	44	0	34	139
Oldsmar Sand*	0	7	0	143	150
Ona Sand	0	25	0	0	25
Pomello Sand	0	10	50	1	61
St. Johns Basinger Placid Soils*	1,051	1,267	0	1,048	3,366
Zolfo Sand	0	182	28	12	222
Total	3,131	4,014	2,348	3,960	13,452
Water	21	14	0	0	35
Total	21	14	0	0	35
Grand Total	3,864	4,374	3,526	6,989	18,753

* Soil series in italics are classified as hydric soils

Soil Moisture

Estimated north and south range hydric and non-hydric soil series, based on the U.S. Department of Agriculture, Natural Resources Conservation Service published list of hydric soils, are identified in Table 3-15. Eighteen (includes water) of the 25 north and south ranges soil series are classified as hydric, which encompass 90 percent (approximately 16,828 acres) of the total

ranges land area. The eight non-hydric soil series account for 10 percent (approximately 1,926 acres) of the total ranges land area.

Water Table

In the low, flat terrain of APAFR, the water table is typically less than 10 feet below the surface and generally parallels the configuration of the ground surface but with far less relief. The estimated SHWT for the proposed north and south ranges are illustrated in Figure 3-9 and presented Table 3-16.

Table 3-16. Estimated North and South Range Seasonal High Water Tables (Acres)

SHWT (inches)*	North		South		Total
	Bravo	Foxtrot	Charlie	Echo	
0 or Above	134	87	124	25	370
0 – 6	98	114	189	74	475
6 – 12	1,933	2,270	2,805	2,511	9,519
12 – 18	418	78	464	338	1,298
24 – 42	85		496	22	602
42 – 60	1,175	977	2,911	1,390	6,455
>80	21	0	0	14	35
Total	3,864	3,526	6,989	4,374	18,754

> = greater than; SHWT = seasonal high water table
* Depth in relation to the soil surface

For the north and south ranges, the SHWT is estimated to be 6 to 12 inches (51 percent) and 42 to 60 inches (34 percent) below the surface for approximately 85 percent of the combined range land area.

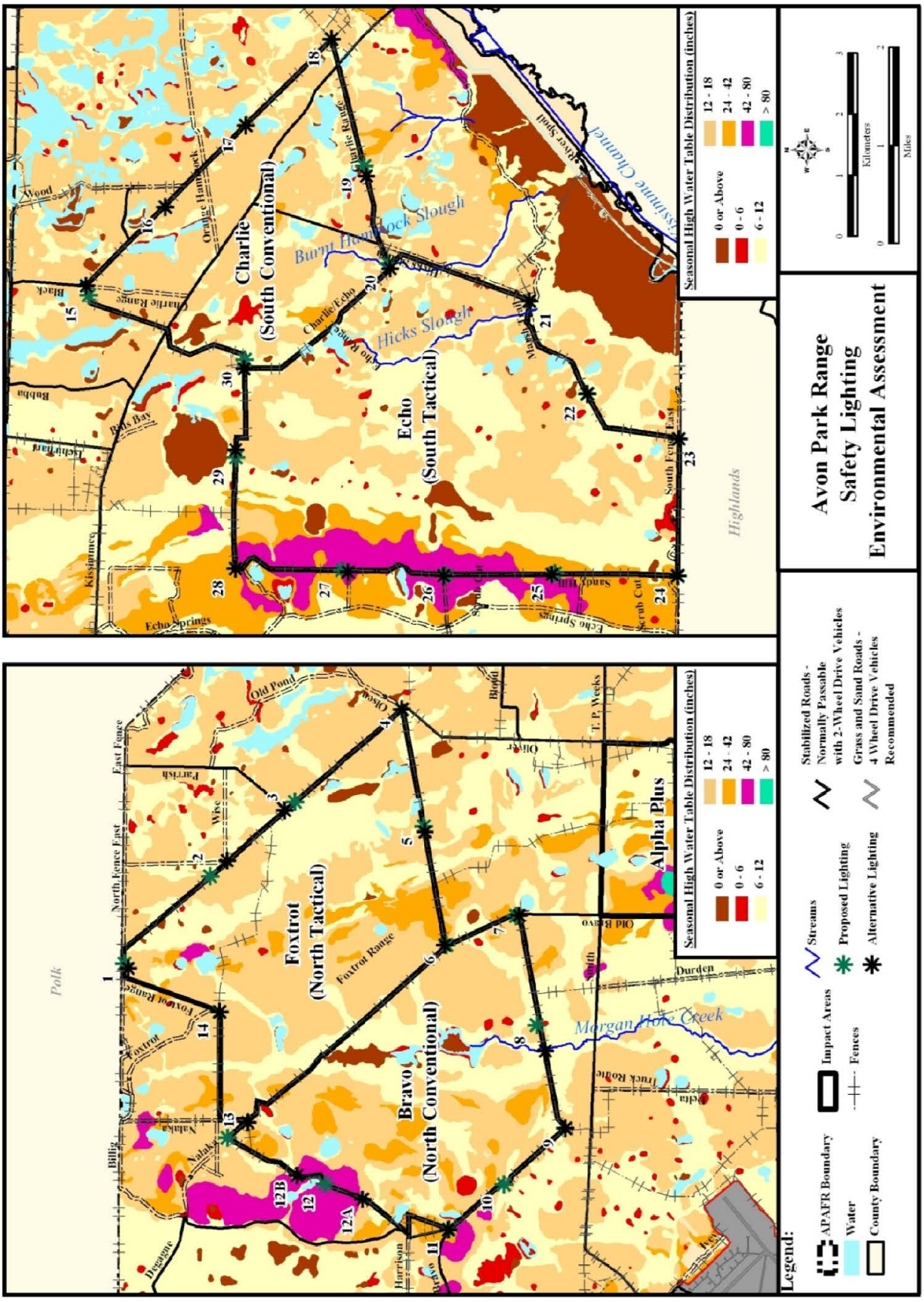


Figure 3-9. North and South Ranges Seasonal High Water Tables

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4. ENVIRONMENTAL CONSEQUENCES

4.1 AIRSPACE MANAGEMENT AND SAFETY

4.1.1 Proposed Action – Install Range Safety Lighting

The installation of the RSLS would have beneficial safety impacts because it would allow users to physically identify range boundaries and allow pilots additional verification of target coordinates. The Air Force Range Operating Agency (ROA) would ensure that RSLS would be highly differentiated from off-range lighting systems in nearby Indian Estates and the River Ranch Acres airfield. The RSLS would represent a distinct pattern, easily discernable by military and non-military pilots.

It is unlikely that the RSLS system would attract birds or result in increased bird/wildlife-aircraft strike hazards for aircraft flying sorties over the ranges because birds are not strongly attracted to green and infrared lights (see further discussion in Section 4.3, Biological Resources).

4.1.2 Alternative 1 – Install Range Safety Lighting at Alternate Locations

The alternate RSLS locations would provide the same benefit with regard to improved safety as the proposed locations. The alternate RSLS light locations, though slightly different than the proposed locations, would create a distinct pattern of lights around the APAFR ranges to make them easily visible to pilots.

4.1.3 No Action Alternative

The No Action Alternative would result in a less than optimal level of safety, although the past safety record for off-range impacts is impressive. Since 2005, there have been over 47,000 sorties with no off-range bombs, fires, or public safety issues. Aircraft are equipped with advance targeting systems that control ordnance release and minimize the statistical probability of an off-range incident or other mishap. Even without lights, confusion with adjacent communities is unlikely. The Indian Lakes Estates community is marked by its own street lights, and the River Ranch Acres Resort airfield north of Foxtrot Range is also illuminated. APAFR observes procedures for recovering any off-range ordnance, reacting to medical emergencies, protecting public property, and responding to wildfires and other environmental hazards.

The Air Force prepared an ORMA that specifies procedures the Air Force would follow if the lights are not installed. The six steps that would be strictly adhered to are explained in detail in Appendix B and are as follows:

1. Identify the Hazard: The Air Force would describe real or potential conditions that could impact operations, personnel, and infrastructure.
2. Assess the Risk: The Air Force would conduct quantitative or qualitative evaluations of mishap severity and probability.
3. Analyze Risk Control Measures: The Air Force would develop measures to control risks.
4. Make Control Decisions: The Air Force would select risk control measures to be implemented, identify where they will be implemented, and develop a strategy to

maintain the controls. The Air Force would make recurring footprint checks, conduct daily monitoring and follow Air Force directives.

5. Implement Risk Controls: The Air Force would make implementation clear and establish accountability and support.
6. Supervise and Review: The Air Force would monitor and review the operation to make sure controls remain effective and provide feedback with emphasis on documenting any negative trends.

4.2 SURFACE WATERS, WETLANDS, AND FLOODPLAINS

This section addresses potential effects to water resources as a result the implementation of the Proposed Action. Impacts to groundwater and streams are not anticipated; therefore, analysis focused on the potential for impacts to wetlands and floodplains, and measures to minimize impacts where possible are provided.

4.2.1 Proposed Action – Install Range Safety Lighting

Wetlands

Under the Proposed Action, the RSLS would be placed around the perimeter of the impact ranges at APAFR at intervals of approximately one mile. Where possible, installation of the light poles would avoid wetlands. Where avoidance of wetlands is not possible due to operational constraints of the RSLS, the light poles would be placed within wetlands, encased in concrete in a hole approximately 2 feet deep. No more than 15 light poles in total would be placed within wetlands.

Vegetative clearing to access the RSLS would be kept to a minimum as existing fence lines, fire breaks, and roads would be utilized where possible. Where vegetative clearing is anticipated due to lack of fence lines and roads, the Air Force would hand-clear a 10-foot-wide maintenance corridor and would access the installation points from the closest range road. These maintenance corridors would not be improved or heavily traveled and would be constructed to minimize any adverse effects to wetlands by following preconstruction contours and elevations. Access to the RSLS would only be needed occasionally. Table 4-1 lists RSLS lights that require vegetative clearing and/or a delineation. In addition, those lights that may be within a wetland but require a delineation to confirm are also included in Table 4-1.

Table 4-1. RSLS Proposed Action Locations Within Wetlands

Range	Proposed Lighting System Number	Requires Clearing of Vegetation	Requires Delineation
Foxtrot	1	Yes	Yes
Foxtrot	2	No	Yes
Foxtrot	3	Yes	No
Foxtrot	5	No	No
Bravo	7	No	Delineation will Confirm if in Wetland
Bravo	8	No	Yes

Table 4-1. RSLS Proposed Action Locations Within Wetlands, Cont'd

Range	Proposed Lighting System Number	Requires Clearing of Vegetation	Requires Delineation
Bravo	9	No	Delineation will Confirm if in Wetland
Bravo	10	No	Delineation will Confirm if in Wetland
Bravo	12	Yes	Yes
Bravo	13	Yes	Yes
Foxtrot	14	No	Yes
Echo	29	Yes	No
Echo	30	No	Delineation will Confirm if in Wetland

Activities required for the construction of the Proposed Action are expected to cause less than 0.5 acre of wetland loss in total. To comply with the exemptions of the Nationwide Permit 12, all SFWMD and USACE guidelines and PCN requirements would be followed where applicable. The USACE would make a determination as to whether a jurisdictional wetland determination would be required for wetland areas anticipated to be affected by the Proposed Action and has agreed to verify any in-house wetland determinations.

Further, activities in wetlands would be in accordance with EO 11990, *Protection of Wetlands*, which requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Based on the requirements set forth in AFI 13-212, Section 4.15 Night Operations, the RSLS must be installed at the APAFR. There is no practicable alternative to the Proposed Action as wetlands are prevalent throughout the proposed RSLS locations; subsequently, complete avoidance of wetland impacts is not possible. However, impacts to wetlands would be minimized to the greatest extent practicable.

Floodplains

Lights #20 and #21 would be located within the 100-year floodplain. Areas of 100-year floodplain are located throughout the project area, with the majority occurring on the southern ranges of APAFR (Figure 4-1). EO 11988, *Floodplain Management*, requires that federal agencies avoid adverse impacts associated with the occupancy and modification of floodplains and avoid floodplain development whenever possible. Based on the proposed location of the RSLS, complete avoidance of floodplains would not be possible. Impacts to floodplains would be minimized by ensuring that no topography alteration or increase in the base flood elevation would occur. A Finding of No Practicable Alternative would be required in accordance with EO 11988.

Storm Water

APAFR currently operates under a NPDES Permit for Stormwater Discharge associated with industrial activities. This NPDES Permit was last updated in 2006. A NDPES permit for storm water discharge would not be required under the Proposed Action because only .22 acres acre would be disturbed, which is less than the threshold of 1 acre.

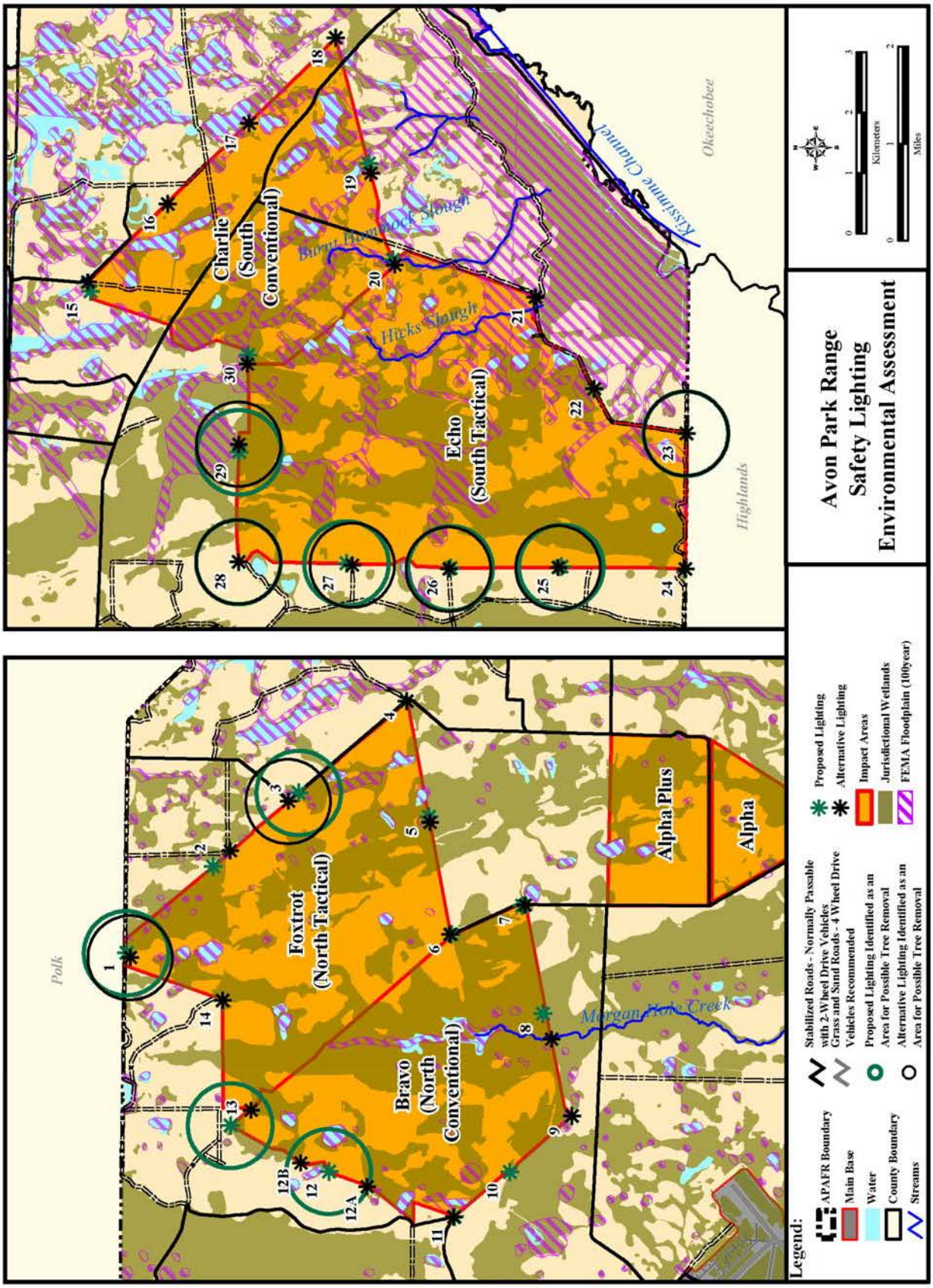

Figure 4-1. Proposed Action – Location of Proposed Lighting at Foxtrot/Bravo Ranges

4.2.2 Alternative 1 – Install Range Safety Lighting at Alternate Locations

Wetlands

Table 4-2 lists the alternate light locations that would either be located in a wetland or would require a delineation to confirm otherwise. Alternative 1 would result in up to 10 light locations being located in a wetland, compared to the Proposed Action, which would have up to 13 light locations in a wetland. It should be noted that Alternative 1 Light #13 provides an access route away from wetlands, though the light itself would still be within a wetland.

Table 4-2. Range Safety Lighting System Alternate Locations Within Wetlands

Range	Alternative 1 Lighting System Number	Requires Clearing of Vegetation	Requires Delineation
Foxtrot	2	No	Yes
Foxtrot	5	No	No
Bravo	7	No	Delineation will Confirm if in Wetland
Bravo	8	No	Yes
Bravo	9	No	Delineation will Confirm if in Wetland
Bravo	13[a]	Yes	Yes
Foxtrot	14	No	Yes
Charlie	19	No	Delineation will Confirm if in Wetland
Echo	29	Yes	Delineation will Confirm if in Wetland
Echo	30	No	Delineation will Confirm if in Wetland

a. Alternative Light #13, though located within a wetland, provides an access route that avoids wetlands, unlike Proposed Action Light #13.

Floodplains

Alternative 1 relocates Light #20 out of the floodplain. Light #21 is the same as for the Proposed Action and would still be within the floodplain. No alterations to topography or changes in floodplain drainage would occur from the installation and maintenance of the RSLS.

Storm Water

As with the Proposed Action, Alternative 1 would not require a NDPES permit because only 0.22 acre would be disturbed, which is less than the threshold of 1 acre.

4.2.3 No Action Alternative

Under the No Action Alternative, no construction or land clearing would occur. Therefore, water resources within the project area and installation would be unaffected.

4.3 BIOLOGICAL RESOURCES

4.3.1 Proposed Action – Install Range Safety Lighting

Installation and Maintenance

Installation of the RSLS would potentially require the removal of trees and shrubs at 10 locations (Figure 4-2 and Figure 4-3). The tree removal is necessary to allow aircraft crews to see the lights at a distance. The height of trees removed is directly dependent on the distance of the trees from the light source.

Since each lighting unit is self-contained and independently powered, the noise and disturbance associated with this part of the Proposed Action would be confined to the immediate area where the light pole would be placed. Power augers, chain saws, and vehicles would create brief noise disturbances during the installation and could temporarily affect projected species. In contrast, the existing noise environment is dominated by aircraft overflights, Army ground training, rocket launches and natural noises, including intense and frequent thunderstorms. Noise from one installation should not create combined effects since the light pole locations would be approximately one mile apart. Most light pole locations would be adjacent to fence lines and firebreaks, allowing for relatively easy access and precluding the need for extensive vegetative clearing in most cases. The noise associated with tree clearing would be dominated by chain saws, which may last for several hours and, along with human presence, cause birds and wildlife to temporarily leave the area. Maintenance would consist of replacing batteries and other components as necessary, and resetting the systems in the event they are disabled by lightning strikes, wildfires, or other unforeseen events. Since off-site road stabilization materials would not be used for road maintenance (Section 2.1.2), the potential for introducing invasive plant species associated with heavy equipment operation would be minimal.

Effects of Line of Sight Tree Clearing

A preliminary visual inspection of aerial photos revealed several locations where trees near proposed light locations may prevent desired line of sight of pilots at altitude. APAFR personnel visited each RSLS light location and identified which trees would require removal. Potential effects from tree removal pertain to the loss of pine plantation area, reduction of RCW forage area, direct disturbance to other protected plant and animal species, and fostering conditions which would encourage the spread of invasive species.

Effects to Plant Communities and Wildlife

Installation of the RSLS would require the clearing of trees and shrubs at some of the light locations to allow personnel access to the lights and a clear line of sight by pilots. Analysis of available rare plant information indicates that several rare plants or aggregations of rare plants are located within 500 feet of some of the light locations. This distance was arbitrarily selected to provide an assessment of the potential for impacts to rare plants from construction equipment. Table 4-3 lists rare plants within 100 feet of proposed light locations. These would potentially be susceptible to direct impacts from construction equipment during installation of the RSLS. Existing roads are available to access the RSLS locations in most cases. Installers would need to

coordinate with APAFR Natural Resources personnel to avoid driving over rare plants in areas with no established roads.

Table 4-3. Rare and Federally Listed Plants Within 100 Feet of Proposed Lighting Locations

Range Light Number	Range	Common Name	Species	# of Individual Plants	Year Surveyed
26	Echo	Pigeon Wing	*Clitoria fragrans*	45	2002
27		Florida Jointweed	*Polygonella basaramia*	15,000	2003
27				10,000	2004
25				1,500	2004
26				50	2007
27				2,000	2007

Federally protected plant species are also located near Lights #12 and #24. There are also numerous other state listed and rare plant species which could potentially be affected. However, APAFR personnel visited each light location and did not note the presence protected plant species in the immediate vicinity of the proposed light locations other than those shown in Table 4-3.

Effects to Protected Animal Species

Florida Grasshopper Sparrow *(Ammodramus savannarum floridanus)*

FGS habitat would be potentially affected by installation at eight light locations (Table 4-4). Because this species nests on the ground, the area would have to be carefully surveyed before any site clearing or transport of materials off of the roads and through scrub habitat. As applicable, bird spikes would be installed on light poles near FGS habitats, to prevent avian predators from using the structures as perching sites.

The USFWS concurred with APAFR with a may affect, but not likely to adversely affect, the FGS determination by installing the lights in FGS habitat as described in Alternative 1. The justification was that the project area would be small and bird spikes would be placed on top of the lights to discourage avian predators (Appendix E).

Table 4-4. Grasshopper Sparrow Habitat Management Units Within 500 Feet of Proposed Range Lights

HMU Name	Range Light ID
Bravo	6
	7
	8
Echo	18
	19
	20
	21
	22

HMU = Habitat Management Unit

Florida Scrub Jay *(Aphelocoma coerulescens)*

There is a possibility that the installation of lights would serve as a perching spot and attract avian predators which might impact the FSJ. Woolfenden and Fitzpatrick (1984) identified predation as a primary cause of FSJ nest failure. FSJs were found to be most vulnerable to raptor predation in October, March, and April when the densities of migrating accipiters and falcons tend to be high (Woolfenden and Fitzpatrick, 1996). In overgrown scrub habitats, FSJ predation efficiency tends to increase (Woolfenden and Fitzpatrick, 1996; Toland, 1999).

Research has demonstrated that artificial raptor perches can attract predators, though increased predation success is not always associated with the presence of artificial perches. Kim et al. (2003) found American kestrels (*Falco sparverius*) used artificial perches more often than natural woody vegetation in south Texas coastal prairie grasslands.

As a follow up to the Woolfenden and Fitzpatrick study, Schaub et al. (1992) examined the ecological and social factors that may affect predation on eggs and nestlings of the FSJ. Results from this study, indicated that the majority of nest predation occurred during daylight hours, when young were present versus eggs, and implicated snakes as the primary nest predator. Thus, although the RSLS might attract bird species to use lights as a perch, the spacing of the lights would mean that no more than two perches per mile would be created (each light is about a mile apart). Given this low number of added perches and no increased attractiveness to the FSJ primary predators (snakes) of FSJ populations, the likelihood that the RSLS would increase the risk of predation to the FSJ is low. However, rather than risk adverse effects to this protected species, the Air Force would add bird spikes to RSLS lights located in or near FSJ habitat to prevent raptors from using them as perches. Bird spikes are an effective and safe solution to deter birds without harming people or wildlife or interfering with electrical or communication transmissions. Potential Proposed Action light locations within FSJ HMUs include: #6, #7, #10, #11, #12, #13, #18, #24, #25, #26, #27, and #28. Potential light locations within 500 feet of active FSJ territory are listed in Table 4-5.

The USFWS concurred with APAFR with a may affect, but not likely to adversely affect, the FSJ determination by installing the lights in FSJ habitat as described in Alternative 1. The justification was that the project area would be small and bird spikes would be placed on top of the lights to discourage avian predators (Appendix E).

Table 4-5. Scrub Jay Territory and Sites Within 500 Feet of Proposed Action Lighting Locations

Range Light Number	Range	Territory ID	Breeding?	Group Size
11	Bravo	WEBR09	N	3
10		SEEP09	Y	2
6	Foxtrot/Bravo	NEXT09	Y	3
6		ENDD09	Y	4
28	Echo	NORE09	Y	2

Red-cockaded Woodpecker *(Picoides borealis)*

RCW forage area would be affected from the removal of trees at a few proposed light locations. Table 4-6 below lists light locations and potentially affected cluster areas, identifying those clusters which would be adversely affected by the loss of habitat. Methods for analysis followed USFWS South/Central Florida Recovery Unit Foraging Guidelines for Satisfying the Standard for Managed Stability for RCWs (USFWS, 2006).

The USFWS concurred with APAFR with a may affect, but not likely to adversely affect the RCW determination by installing the lights in RCW habitat as described in Alternative 1. The justification was that the construction was brief and human traffic for maintenance minimal (Appendix E). Table 4-6 shows the existing conditions of the clusters near RSLS light locations and compares current acreage and tree basal area with the post tree removal condition. Clusters that are already at or below minimum standards are assumed to be further adversely affected. Tree removal from a cluster forage area that does not result in a decrease below acceptable USFWS service standards results in a conclusion of no adverse effect, or not likely to adversely affect. Light locations within a cluster area that do not require any tree removal result in a conclusion of no effect.

Other Protected Wildlife Species

APAFR is home to numerous other protected wildlife species, as discussed in Chapter 3, including the indigo snake (federally listed as threatened), the gopher tortoise (state listed as threatened) and several birds. The level of information on burrow or nest location, and on territory and movements, is not as detailed as that for the RCW, FSJ, and FGS, which are managed species at APAFR. However, there is still a potential to affect these species through the installation and maintenance activities associated with the RSLS. Any impacts would likely consist of temporary disturbance. APAFR personnel routinely perform gopher tortoise surveys prior to ground-disturbing activities, such as new construction, excavation, new off-road activities, ground maneuver activities, and roller drum chopping. Personnel involved in site installation and maintenance would have to be informed of the protected status of these species in case of a chance encounter. Gopher tortoise burrows would be avoided if possible, and if not, the gopher tortoise would be relocated. The Florida panther has only been documented once at APAFR and would not be affected.

Operation

The analysis of potential effects from operation are focused on the light produced from the RSLS, as other components such as noise from the system would be very minor. The system itself is not expected to generate audible noise aside from perhaps a low electrical hum when operating. Noise from operation would be very minor in comparison to the existing military testing and training environment and the natural noise environment. The following analysis evaluates the potential for green and infrared spectrum lighting to affect plants and wildlife, based on the available information in the literature.

Effects to Plant Communities

There is limited data available about the impacts of outdoor artificial lighting on plant communities. One study suggests that extending daylight hours via artificial light will disrupt a plant's regeneration cycle that occurs over night, but these studies address fixed, constant white light sources such as street lamps (Royal Astronomical Society of Canada, 2009). In study, effects were limited to an immediate radius around the light, which was a downwardly directed source. In contrast, the APAFR RSLS would be an intermittent green and infrared light, with light directed upward and an expected operation frequency of one to two nights per week. Approximately 20,000 to 80,000 lux of artificial light is required to cause a response in plants (Narisad and Schreuder, 2004). By comparison, direct sunlight ranges from 32,000 to 130,000 lux. The output of the RSLS Luxeon V-Star™ green LED is 160 lumens per square foot, which is roughly equivalent to 1,700 lux and much less than that needed to elicit a response in plants. Wang et al., 2007 exposed the algae *Spirulina platensis* to LED light of differing spectra. Next to blue wavelength light, green light was found to have the least effect on growth and red light (not infrared) had the greatest effect on algal growth. The intensity of light in the experiment was much greater than what the RSLS system would be expected to project into surface waters or wetlands on the ranges, one reason being lights would not be directed downward. Thus, plant communities near the lights should not be affected from RSLS operations.

Effects to Birds

The impact to birds is expected to be minimally adverse as the available scientific literature indicates that birds do not see green light well, and thus are not strongly attracted to it (Rich and Longcore, 2006). The concern with regard to attraction would be that migrating birds could deviate from their natural course or "fall out" (land in large numbers) onto range areas where active missions were occurring, posing a human safety hazard and aircraft collision risk. As stated, it is highly unlikely that the RSLS would pose such an attraction due to the color and expected frequency of operation of the lights. Studies of bird response to lit radio towers indicate that birds exhibit more non-linear flight (meaning they circle the tower or deviate from straight path flight) based on the type of light on the tower. Red visible light was found to have the greatest effect, and it is theorized that certain colors interfere with the magnetoreception mechanisms that birds use during migration to navigate (Gauthreux and Belser, 2006). In a study of bird attraction to offshore petroleum structures, birds did not exhibit a response to infrared light, which is not part of the visible light spectrum (Poot et al., 2008). Wiltschko et al., (2004) found that migratory birds became disoriented from their migratory direction in the presence of 590 nm yellow or 635 nm red light, but remained well oriented under green light up to 564 nm, even when pre-exposed to darkness.

Table 4-6. Tree Clearing Effects on Red-cockaded Woodpecker Forage Area

Light Number /Action	ID #s of Clusters or Cluster Forage Within 0.5 mile	Total Partitioned Forage (Acres)	Partitioned >9 Inches (Square Feet)	Total Partitioned (Square Feet)	Total Non-Partitioned Forage (Acres)	Total Square Feet >9" that Would be Removed	Remaining Square Feet >9 Inch Basal Diameter	Acre and Basal Area Requirement Still Met After RSLS Tree Removal?	Conclusion
#1/Proposed	7	150	2,000	2,000	340	15.45	1,984.55	Yes	Cluster #7 is already under minimum of 3,000 square feet for partitioned only; well over if total non-partitioned is considered. Thus, may affect, NLAA.
#1/Alternative	7	150	2,000	2,000	340	17.64	1,982.36	Yes	NLAA
#2/Proposed	36	210	6,100	7,500	270	8.64	6,091.36	Yes	Mostly pine plantation cleared. NLAA.
#2/Alternative	36	210	6,100	7,500	270	2.53	7,497.47	Yes	Mostly pine plantation cleared. NLAA.
#12A/Alternative	5/16	100/190	600/11,000	2700/11,150	100/225	None	Not Applicable	No Tree Removal	No Effect
#12/Proposed	5/16	100/190	600, 11,000	2,700/11,150	100/225	Unknown but any amount potentially adverse	Not calculated	No Cluster #5/ Yes Cluster #16	Cluster #5 is already under minimum area for both shared and partitioned; the majority of the partitioned area is <9 inch basal diameter. Thus, assume LAA. Cluster #16, NLAA.
#12B/Alternative	5/16	100/190	600/11,000	2,700/11,150	100/225	None	Not Applicable	No Tree Removal	No Effect
#13/Proposed	21	275	4,600	5,530	275	9.92	4590	Yes	NLAA
#13/Alternative	21	275	4,600	5,530	275	None	Not Applicable	No Tree Removal	No Effect
#14/Proposed and Alternative	57	400	8,000	11,000	400	78.64	7,921	Yes	NLAA
#16/Proposed and Alternative	54	210	2,600	2,700	210	3	2,597	No	Cluster #54 is already under minimum, even with shared square footage (not shown); assume LAA.
# 17/Proposed and Alternative	31	180	3,100	3,100	180	.7	3,099	Yes	Cluster #31 is near minimum but not under; all BAs > 9 inches; assume NLAA.

BA = Basal Area; ID = identification; LAA = Likely to Adversely Affect; NLAA = Not Likely to Adversely Affect; RSLS = Range Safety Lighting System; sq. ft. = square foot

Wiltschko et al., (1993) observed lower activity with blue light but attributed that to the strength of the bulb, which raised the temperature slightly, likening the lower activity to the damping effect heat has on autumn migratory activity. He concluded no difference between green or blue light regarding misorientation with test subjects. As mentioned in Chapter 2, the RSLS would emit green light at 505 nm.

Rappl et al (2000) concluded that light wavelength dependent magneto-reception was widespread among birds, given that experiments had shown this mechanism to be present in birds from different orders and three different families. Their experiments with pigeons found magnetic orientation in these species was not affected by green light, whereas red light did cause misorientation, similar to experiments with robins, thrushes, and warblers (Wiltschko et al., 1993; Wiltschko and Wiltschko, 1995; Wiltschko and Wiltschko, 1999).

Collisions, commonly noted with lit cell and radio towers and tall buildings, are unlikely to occur with the RSLS. The causative factors in bird-tower collisions are the height of the structures, flight altitudes of birds, whether the towers are supported by guy wires, and the color and type of light. Fixed red lights or white lights have the highest incident of bird mortality from collision. Flashing or strobe lights have been found to reduce bird attraction to communication towers, regardless of light color (Gauthreux and Belser, 2006). The height of the RSLS lights and the expected low attraction of birds to green light suggest that the potential for birds to collide with RSLS lights is low.

There is a potential for lights to indirectly affect foraging behavior of nocturnal (nighttime species) or to allow species that normally forage during the day to expand their foraging time. Though directed upward, some diffusion of light from the RSLS is expected to reach the ground and surrounding vegetation. Biological rhythms related to foraging, reproduction patterns, migration, communication, and sustainability can be affected by artificial light (Rich and Longcore, 2006). A study performed on the effects of roadway lighting on black-tailed godwits (*Limosa l. limosa*) in wet grassland habitats, concluded that the density of nests was slightly but statistically lower up to 300 meters (m) away from the lighting at roadway and control sites. Songbirds may be impacted by some types of artificial light. The seemingly extended daylight hours created by artificial lights causes some birds to sing at unnatural hours. Scientists have determined that extended daylight hours can induce early breeding; longer feeding durations and changing migration schedules (Molenaar et al., 2006).

The studies above that determined these light impacts to bird foraging and nesting behavior are relevant to the analysis of the APAFR system in that they demonstrate that effects can and do occur. However, the lights documented to result in impacts to birds are drastically different from lights proposed for the RSLS. Notably, these differences include a closer spatial arrangement of the lights than the proposed RSLS; a broad area of constant, higher intensity, and downwardly directed illumination; and a typically artificial white light spectrum as opposed to a single color. With these considerations, and with the understanding that RSLS would be spaced approximately one mile apart such that any diffuse illumination would be very local in nature, impacts to bird behavior are not expected to have adverse effects.

In addition to orientation, researchers have studied other effects of light on birds. Rozenboim et al. (2004) exposed chicken eggs to light of different color and found green light stimulated

growth and development in chicks, increased blood T lymphocytes, and increased serum anti-viral levels for Newcastle disease when compared to exposures to red light. Blue light also enhanced immune response.

Effects to Mammals

Artificial lighting has been shown to affect growth rate in juvenile bats, or cause entire colonies to fail, though existing studies are of limited usefulness for direct comparisons to the RSLS which would consist of different lighting, and by comparison, a much reduced frequency of operation than light found to have impacts. Boldogh et al. (2007) studied the effects of typical outside lighting, such as floodlights, on house-dwelling bat colonies. Lights in the study typically remained on for several hours or throughout the duration of the night. Juveniles in artificially lit buildings were significantly smaller and had slower growth rates than those living in unlit buildings, but researchers did not provide an explanation of the mechanism that caused the impacts. The RSLS would only be utilized one to two nights per week. The RSLS should not affect bat orientation or direction of flight, as research indicates at least long-distance navigation in bats appears strongly related to the Earth's magnetic field (Wang et al., 2007; Holland et al., 2008). Since bats do not see well, light from the RSLS is not anticipated to have adverse effects.

Effects to Reptiles and Amphibians

Reptiles and amphibians include snakes and turtles, frogs, toads, and salamanders. Frogs and toads may be particularly susceptible to artificial light because most are partly or completely nocturnal (Buchanan, 2006). They forage at night and are predators of other nocturnal animals. Because of their dependence on certain habitats, such as a water body, some frog species may not be very mobile. These would be less able to compensate for changes in light levels at night. Juvenile toads have been observed to congregate under streetlights to prey on insects attracted by the light, while some species have been observed to avoid artificial light altogether (Buchanan, 2006). Organisms accustomed to navigating in dark environments could become disoriented from artificial night lighting, as is the case with sea turtles. Changes in light can also cause a temporary reduction in visual capabilities or blindness (i.e., frogs) (Buchanan, 2006).

Studies of reptile and amphibian response to light are few, but generally frogs exhibit a "blue preference," supposedly because blue may indicate the presence of water (Buchanan, 2006). However, one study found that certain tree frogs that were adapted to the dark were observed to show a preference for green light at high illumination. Based on this information, there is a potential for tree frogs to be attracted to the RSLS. Because the RSLS lights would be operated one to two nights per week and turned on only as needed during a given mission, it is unlikely that long-term changes in habitat or behavior in tree frogs would result from the installation of the RSLS.

Newts, a type of salamander, were found to exhibit altered magnetic compass orientation when exposed to long-wavelength light greater than 500 nm, which is comparable to light from the RSLS (Philips and Borland, 1994; Philips et al., 2002). The shift in orientation was found to be a direct result of the effect of the light on the magnetoreception mechanisms in the newts. The light source and intensity in the experiment were different than what would be produced by the RSLS lights, which would be directed upward. It is unknown whether the outward diffusion of

light from the RSLS would be sufficiently intense enough, or within close enough proximity, to cause misorientation in amphibians. Additionally, the experiments did not interpret their results in the context of having effects on survival or long-term misorientation on amphibians.

The RSLS would also emit infrared light, which is detectable by some species of snakes from the Crotalid or pit viper family. Pit vipers include rattlesnakes, water moccasins, and coral snakes, all of which are venomous. Since the RSLS lights would be elevated approximately 10 feet above the ground, attraction is not likely to be an issue for these snakes. Adverse effects on reptiles and amphibians are not anticipated.

Effects to Insects

Studies indicate that insects are attracted to outdoor lighting and congregate around lighted areas. As a result insects may expend energy staying near light sources that they would otherwise spend on mating and migration (Eisenbeis, 2006). Species that prey on the insects may find foraging to be easier as their food is concentrated on one location. As with other species, literature indicates that light color is a key factor in light attractiveness with regard to insects. Ashfaq et al. (2005) found that higher wavelengths such as ultraviolet and blue light attract the lowest number of insects compared to lower wavelengths like red and green (Table 4-7). Researchers collected eight orders of insects: Lepidoptera (butterflies and moths); Diptera (flies and mosquitoes); Coleoptera (beetles); Ephemoptera (mayflies and dragonflies), Hemiptera (cicadas, aphids); Orthoptera (grasshoppers, crickets), Dermaptera (earwigs) and Plecoptera (stoneflies). None showed a marked preference for green light. Thus, the RSLS green spectrum lights are not expected to strongly attract insects, nor animals that feed on these insects.

Table 4-7. Percentage of Insects Attracted to Different Colored Light at Night

Light Color	Experimental Location 1	Experimental Location 2
Red	2.2	2.4
Yellow	10.6	8.5
Green	4.7	3.1
White	18	16.7
Ultraviolet	42.1	50.9
Blue	22.4	18.3

Source: Ashfaq et al., 2005

Certain beetles have the ability to detect infrared light, as do some insects that feed on blood (Campbell et al., 2002). In the case of the beetle *Melanophilia acuminata*, this insect lays its eggs in trees freshly killed by fire, attracted to the heat from the burnt wood (Schmitz and Bleckmann, 1998). Given the few readily available examples in the literature, infrared detection and attraction by insects does not appear to be common. Thus, the RSLS infrared lights are not expected to attract insects, nor animals that might feed on these insects.

4.3.2 Alternative 1 – Install Range Safety Lighting System at Alternate Locations

Installation and Maintenance

Installation and maintenance under Alternative 1 would follow the same procedures and use the same equipment as described for the Proposed Action locations. However, Alternative 1 incorporates a process of exclusionary mapping to avoid environmental effects to biological

resources, where possible. As mentioned in Section 4.3.1, the USFWS concurred with APAFR with that Alternative 1 may affect, but is not likely to adversely affect the FSJ, FGS, and RCW. The justification was that the construction was brief and human traffic for maintenance minimal (Appendix E). The discussion of potential effects to protected species from light presented in Section 4.3.1 is applicable to Alternative 1.

Effects of Line of Sight Tree Clearing

Effects to Plant Communities and Wildlife

Alternative 1 light locations within 500 feet of federally protected plant species are listed in Table 4-8.

Table 4-8. Federally Listed Plants within 500 Feet of Alternative 1 Light Locations

Range Light Number	Range	Common Name	Species	# of Individual Plants	Year Surveyed
12B	Bravo	Pigeon Wing	*Clitoria fragrans*	17	2002
14	Foxtrot			7	2003
26	Echo			45	2002
				200	2002
28	Echo	Florida Jointweed	*Polygonella basaramia*	2000	2003
27	Echo			15000	2003
27	Echo			10000	2003
26	Echo			100	2004
26	Echo			2200	2004
25	Echo			1500	2004
24	Echo			1500	2004
12B	Echo			35	2004
12B	Bravo			107	2002
12B	Bravo			63	2002

Impacts to Florida hairy jointweed (*Polygonella basiramia*) at Light #12B would be unavoidable because the only access route to the light location would be down the disc line, where the plants are growing. This species tends to populate fire disk-lines because the occasional surface disturbance creates site conditions that promote stable plant communities. These annuals tend to recover rather quickly from occasional disking (once or twice annually) with no adverse affects to the viability of plant communities. Field visits by APAFR personnel concluded Alternative 1 light locations for #24, #25 and #26 could be accessed without effects to protected plant species.

4.3.3 No Action Alternative

The No Action Alternative would mean that the RSLS would not be installed and the removal of trees would not be necessary. From a biological resource standpoint, this is preferred as it requires no disturbance to plants or wildlife. There would be no additional noise, other than that produced by the existing manmade and natural environment.

4.4 ANTHROPOGENIC RESOURCES

This section addresses potential effects to anthropogenic resources as a result of the implementation of the Proposed Action. Analysis focused on the potential for impacts to the dark sky at the FKPP and the number of overnight visitors to the park. Measures to minimize impacts are provided where possible.

4.4.1 Proposed Action – Install Range Safety Lighting

Installation and Maintenance

The installation and maintenance of lights would not have any impact on anthropogenic resources because the RSLS would be entirely located on APAFR. Minimal noise from tree clearing would be produced and would not adversely affect communities adjacent to the range.

Operations

The artificial light emitted from the installation of the range safety lighting at APAFR has the potential to create distant light pollution which could adversely affect the amount of "dark sky" perceptible to the public. At nearby FKPP, a Florida state park, dark sky conditions are an attraction for nighttime campers and recreationists that like to stargaze. Any change in dark sky conditions could consequently affect the number of overnight visitors to the FKPP or detract from the quality of their visit. The closest RSLS light to the park would be located approximately seven miles away. The landscape of the FKPP is relatively flat and thus, lights from even the closest city, Sebring, which is located 25 miles from the FKPP, impact stargazing, especially if viewers look toward the horizon. However, many of the RSLS would be surrounded by vegetation which would serve to block the light from the FKPP. In addition, the RSLS is closer in proximity to the FKPP than Sebring, but only consists of 30 individual light locations compared to estimated thousands of lights from the closest city. The scale of light diffusion from the RSLS is unlikely to be of an intensity to affect nighttime viewing conditions 7 miles away. The FKPP dark sky condition is currently designated as a Class 3 according to the Bortle Scale (Figure 3-7). This classification is described as rural sky with some indication of light pollution along the horizon. The RSLS lighting at APAFR under the Proposed Action would not be elevated above 10 feet, and thus not directly visible at the FKPP. Some light pollution from the RSLS cannot be entirely ruled out but is not anticipated to change the dark sky classification at the FKPP from a Class 3 designation to a Class 4, since gradations in the scale reflect the amount of light from multiple residential and commercial sources, and transportation. The RSLS would add a total of 30 lights, the closest being about 7 miles from the center of the FKPP. The furthest would be located as far away as 15 miles from the FKPP.

4.4.2 Alternative 1 – Install Range Safety Lighting System at Alternate Locations

The Alternative 1 RSLS light locations are not sufficiently different from the Proposed Action light locations to create a perceptible decrease in artificial night sky brightness. Light #12 for the Proposed Action was replaced with Lights #12a and #12b for Alternative 1. Because these are so far removed from the FKPP, it is highly unlikely that the additional light under Alternative 1 would create a noticeable effect on artificial night sky brightness over the Proposed Action. The closest Alternative 1 lights to the FKPP are very similar in location to the Proposed Action

lights. Thus, no difference should be evident between the Alternative 1 and the Proposed Action, and no adverse effects on recreation at the FKPP are expected.

4.4.3 No Action Alternative

Under the No Action Alternative, the Air Force would not construct lighting features around bombing range boundaries of APAFR. Impacts to anthropogenic resources would not be expected under this alternative. From an anthropogenic standpoint, this is preferred as it requires no potential artificial lighting impacts to the nearby FKPP. In addition, there would be no additional noise disturbance, other than that produced by the existing manmade and natural environment.

4.5 CULTURAL RESOURCES

This section discusses potential impacts to cultural resources, which includes historic and prehistoric resources located within and adjacent to the lighting placement areas. Analysis focused on assessing the potential for impacts to archaeological sites and historic structures from land clearing and construction and on identifying methods to reduce the potential for negative impacts to cultural resources from those activities.

Potential impacts to cultural resources can occur by physically altering, damaging, or destroying a resource or by altering characteristics of the surrounding environment that contribute to the resource's historical significance. Resources can also be impacted by neglecting the resource to the extent that it deteriorates or is destroyed.

Consultation on this action has been completed. The SHPO concurred with APAFR that cultural resources have adequate precautions for establishing the lights under the Preferred Alternative (Appendix F).

4.5.1 Proposed Action – Install Range Safety Lighting

Installation and Maintenance

Land clearing and construction would be required in varying degrees for each of the 30 proposed lighting locations. Construction of light stations and potential creation or widening of lanes along fence lines, in addition to tree clearance activities or brush hogging, all have the potential to adversely affect cultural resources.

Six light placement locations have the potential to adversely affect eligible or potentially eligible sites within the APE. Concerns and recommended actions are discussed below:

- Monitoring of subsurface construction activity by a trained archaeologist is suggested for all locations due to the varying degrees of survey conducted in the past. Areas of special concern and recommendations follow this bullet.

- Near location #13, remnants of the historic Seaboard Airline Railway bed may be present (APAFR, 2008). As this resource travels though and along active impact areas,

monitoring of the construction and surface inspections of areas of high visibility should be undertaken to ensure impacts to these resources are avoided.

- In locations #24, #25, #26, #27, and #28, a dense concentration of archaeological sites, some of which are considered NRHP-eligible, are present. Location #4 has not been surveyed to identify cultural resources. Unless the National Historic Preservation Act section 106 process is initiated and archaeological survey is conducted prior to ground disturbing activities, adverse effects to known cultural resources potentially would occur. In addition to survey, it is required that all of these locations must be monitored by a qualified archaeologist during construction activities. If pole locations are shifted from those currently identified, the Cultural Resource office at APAFR would require consultation (Couturier, 2009).
- Cemeteries are in the vicinity of location #13. Clearly marking or flagging cemetery boundaries prior to construction would ensure no adverse impacts to these resources.

4.5.2 Alternative 1 – Install Range Safety Lighting System at Alternate Locations

Environmental consequences to cultural resources under Alternative 1 would be identical to those presented under the proposed alternative.

4.5.3 No Action Alternative

Under the No Action Alternative, the Air Force would not construct lighting features around bombing range boundaries of APAFR. Impacts to cultural resources would not be expected under this alternative. Under the No Action Alternative, the Air Force would continue to use proposed project areas for training. The likelihood of potential impacts to cultural resources would not change from the current status under this alternative. These areas would continue to be managed in compliance with federal law and Air Force regulations.

4.6 SOIL RESOURCES

4.6.1 Proposed Action – Install Range Safety Lighting System

Potential effects relevant to this analysis include soil disturbance compaction and rutting, seasonal high water tables, and soil trafficking.

Soil Disturbance

Soil disturbance may be categorized as displacement, exposure of mineral soil, compaction, rutting, erosion, mass wasting, nutrient depletion, microclimate changes, and hydrologic changes (Scheerer et al., 1994). The types of soil disturbance evaluated in this analysis, included soil compaction and soil rutting.

Soil compaction is the increase in soil bulk density that results from the rearrangement of soil particles in response to applied force. A limited amount of compaction of disturbed soils may be beneficial, but excessive compaction is detrimental to soil structure. Limited access to water and nutrients, restricted root development, reduced water infiltration and percolation, and reduced aeration are major constraints to plant growth associated with compact soil layers. Compaction

of natural soils can significantly decrease plant production (Busscher et al., 1995; Unger and Kaspar, 1994; Logsdon et al., 1992; Douglas et al., 1992).

Sandy soils have proportionally high bulk densities (1.2 to 1.8 g/cm^3 [grams per cubic meter]) or 75 to 110 lbs/ft^3 (pounds per cubic foot) while silts and clays normally range from 1.0 to 1.6 g/cm^3 or 65 to 100 lbs/ft^3 (Unger and Kaspar, 1994). Under comparable conditions, silt and clay soils generally compact more severely than sandy soils. Soils with low levels of organic matter are generally more susceptible to soil compaction, whereas soils with higher levels of organic matter are more difficult to compact.

Depending on their pattern and orientation, ruts can alter surface drainage, particularly sheet flows, and may also increase soil erosion potentials. Under wet soil conditions, silts and clays are more prone to rutting than sandy soils. Organic soils are highly susceptible to rutting (Arnup, 1998). As soils become saturated, compaction potentials generally decrease and rutting potentials increase (Coder, 2000; Arnup, 1998). Rutting is also influenced by slope, vegetation type, and ground cover.

North and south ranges soil compaction and rutting vulnerabilities are defined in Table 4-9 and illustrated in Figure 4-2 and Figure 4-3.

Table 4-9. Soil Compaction and Rutting Vulnerabilities Variables

Ranking	Description
Soil Compaction	
Severe	Maximum levels of compaction are likely to occur.
High	Levels of compaction are likely to occur but at slightly reduced levels from severe because of potentials for reduced soil water content.
Moderate	Compaction is not likely to occur but may occur as a result of capillary rise within the soil profile or localized water table fluctuations.
Low	Compaction is not likely to occur.
Soil Rutting	
Severe	Maximum levels of deep rutting soil deformation are likely to occur.
High	Significant levels of deep to moderately deep ruts are likely to occur; rutting potentials are slightly reduced because of potentials for reduced soil water content.
Moderate	Soil rutting may occur; however, rut penetration would likely be nominal.
Low	Soil rutting is not likely to occur.

Natural recovery of soils to precompaction and prerutting conditions is extremely slow, if it occurs at all. Recovery of sandy soils is very slow and compacted subsurface layers take much longer to recover. Based on trafficking studies from the timber harvest industry, soil recovery following timber harvest operations generally takes many years.

Seasonal High Water Tables

Soil disturbance under wet conditions can result in considerable soil compaction and rutting damage and can alter subsurface hydrology (Sun et al., 2001). Seasonal fluctuations in APAFR soil water tables can result in saturated soil conditions at or near the soil surface for several

months during the year (see Section 3.2). Soils are most vulnerable to human-induced soil compaction and rutting damage during periods of seasonally high water tables.

Soil Trafficking

Soil trafficking is the exertion of pressure on the soil surface through the tracks and/or wheels of land vehicles. The ability of a soil to carry a certain load depends on a number of characteristics of the soil and the soil water content. Generally, under dry conditions, sandy soils have lower trafficability than clayey soils. All soils become less trafficable as soil moisture content increases (Arnup, 1998). Vehicle weight, wheel/track footprint, and frequency of trips over the same course correlates directly with soil impact potentials.

Heavy equipment, vehicles, and even foot traffic can leave a long-lasting legacy of compacted soils and ruts that can impact the environment. The risk of soil compaction from trafficking depends on the intensity of traffic (number of passes), weight of the vehicle, tire pressure, soil type, ground cover, and soil properties, particularly soil moisture content and texture. Soil rutting primarily occurs as a result of the operation of heavy vehicles on wet soils.

The weight of the vehicle or equipment generally determines the degree of subsoil compaction. Heavier vehicles tend to cause deeper, longer lasting compaction. Most compaction occurs during the first few passes with subsequent trips having limited impact. Generally, compaction is greatest at points with the most passes (King and Haines, 1979). Compaction is most critical on clay and loamy soils that have been disturbed when wet, but compaction can also adversely impact the soil structure of sandy soils.

Installation and Maintenance

Installation would be scheduled to avoid wet and seasonally high soil water table conditions. Based on estimated lightening strikes and routine maintenance needs, light locations would likely required six on-site visits per year.

All but one RSLS light location would be accessed from range main roads, fence line service roads, or silviculture plantation firebreak disk lines off main roads (Figure 2-6 and Figure 2-7). For the Proposed Action, access to Charlie Range light locations #17 and #18 would be gained by off-road travel over natural ground. No new road construction or existing road modifications would be required to access light locations.

A four wheel drive pickup truck would be used to install and maintain the RSLS range perimeter lights at each proposed location. Light maintenance activities would include replacing batteries, vegetation management in proximity to the lights, and system component replacements and repairs. It is estimated that each light location would require an average of six visits per year. This estimate is based on an assumption that each location would receive six disabling lightening strikes per year. In instances where access to RSLS locations by off-road travel over wet areas with high vulnerabilities to soil disturbance is required, light installation and maintenance would be accomplished using all-terrain vehicles (ATVs).

Vegetation and trees would be selectively removed to maintain RSLS sightlines. No vehicular machinery would be used to cut or remove sightline vegetation.

Soil Impact Analysis

To determine soil impacts, the proposed and alternative RSLS light locations for the north and south ranges were evaluated individually to identify potential interactions between the mission indices and the mission event scenario. The results of the analysis are presented in Table 4-10.

Table 4-10. RSLS Light Location Soil Impact Summary

Action	Soil Series[a]	Hydric	Seasonal High Water Table[b]	
			Depth (Feet)	Duration (Months)
Light Location #1 (Foxtrot Range)				
Proposed	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Alternative				
Light Location #2 (Foxtrot Range)				
Proposed	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Alternative	Oldsmar Sand			
Light Location #3 (Foxtrot Range)				
Proposed	Myakka Sand/ St. Johns Basinger Placid Soils	Yes	0.5-1.5/0-1	Jun-Sep./Jun-Feb
Alternative	St. Johns Basinger Placid Soils		0-1	Jun-Feb
Light Location #4 (Foxtrot Range)				
Proposed	Basinger Sand	Yes	0-1	Jun-Feb
Alternative				
Light Location #5 (Foxtrot Range)				
Proposed	Ona Sand	No	0.5-1.5	Jun-Sep
Alternative	Myakka Sand	Yes		
Light Location #6 (Foxtrot Range)				
Proposed	Myakka Sand/Narcoossee Sand	Yes/No	0.5-1.5/2-3.5	Jun-Sep/Jun-Nov
Alternative	Narcoossee Sand	No	2-3.5	Jun-Nov
Light Location #7 (Bravo Range)				
Proposed	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Alternative				
Light Location #8 (Bravo Range)				
Proposed	Myakka Sand/Placid Sand Depression/ St. Johns Basinger Placid Soils	Yes	0.5-1.5/0-1/ 0-1	Jun-Sep/Jun-Mar/Jun-Feb
Alternative	Valkaria Sand		0-1	Jun-Sep
Light Location #9 (Bravo Range)				
Proposed	Basinger Sand Depression/Myakka Sand	Yes	-2-0/0.5-1.5	Jun-Mar/Jun-Sep
Alternative				
Light Location #10 (Bravo Range)				
Proposed	Basinger Sand	Yes	0-1	Jun-Feb
Light Location #11 (Bravo Range)				
Proposed	Myakka Sand/ Narcoossee Sand	Yes/No	0.5-1.5/2-3.5	Jun-Sep/Jun-Nov
Alternative				
Light Location #12 (Bravo Range)				
Proposed	Duette Sand	No	4-6	Jun-Oct
Alternative 12A	Immokkalee Sand	Yes	0.5-1.5	Jun-Sep
Alternative 12B	Duette Sand	No	4-6	Jun-Oct
Light Location #13 (Bravo Range)				
Proposed	Myakka Sand/ St. Johns Basinger Placid Soils	Yes	0.5-1.5/0-1	Jun-Sep/Jun-Feb

Table 4-10. RSLS Light Location Soil Impact Summary, Cont'd

Action	Soil Series[a]	Hydric	Seasonal High Water Table[b]	
			Depth (Feet)	Duration (Months)
Alternative	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Light Location #14 (Foxtrot Range)				
Proposed Alternative	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Light Location #15 (Charlie Range)				
Proposed	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Alternative	Myakka Sand/Basinger Sand Depression		0.5-1.5/-2-0	Jun-Sep/ Jun-Mar
Light Location #16 (Charlie Range)				
Proposed Alternative	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Light Location #17 (Charlie Range)				
Proposed Alternative	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Light Location #18 (Charlie Range)				
Proposed Alternative	Immokkalee Sand	Yes	0.5-1.5	Jun-Sep
Light Location #19 (Charlie Range)				
Proposed	Basinger Sand/Myakka Sand	Yes	0-1/0.5-1.5	Jun-Feb/ Jun-Sep
Alternative	Immokkalee Sand		0.5-1.5	Jun-Sep
Light Location #20 (Charlie Range)				
Proposed	Basinger Sand/Immokkalee Sand	Yes	0-1/0.5-1.5	Jun-Feb/ Jun-Sep
Alternative	Basinger Sand/Myakka Sand		0-1/0.5-1.5	Jun-Feb/ Jun-Sep
Light Location #21 (Echo Range)				
Proposed Alternative	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Light Location #22 (Echo Range)				
Proposed Alternative	Basinger Sand/Sanibel Muck	Yes	0-1/-1-0	Jun-Feb/Jun-Apr
Light Location #23 (Echo Range)				
Proposed Alternative	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Light Location #24 (Echo Range)				
Proposed	Zolfo Sand	No	2-3.5	Jun-Nov
Alternative	Zolfo Sand/Satellite Sand		2-3.5/1.5-3.5	Jun-Nov/ Jun-Nov
Light Location #25 (Echo Range)				
Proposed	Satellite Sand	No	1.5-3.5	Jun-Nov
Alternative	Daytona Sand/Satellite Sand		3.5-5/1.5-3.5	Jul-Nov/ Jun-Nov
Light Location #26 (Echo Range)				
Proposed Alternative	Daytona Sand	No	3.5-5	Jul-Nov
Light Location #27 (Echo Range)				
Proposed Alternative	Archbold Sand	No	3.5-6	Jun-Nov

Table 4-10. RSLS Light Location Soil Impact Summary, Cont'd

Action	Soil Series[a]	Hydric	Seasonal High Water Table[b]	
			Depth (Feet)	Duration (Months)
Light Location #28 (Echo Range)				
Proposed	Narcoossee Sand	No	2-3.5	Jun-Nov
Alternative				
Light Location #29 (Echo Range)				
Proposed	Myakka Sand	Yes	0.5-1.5	Jun-Sep
Alternative				
Light Location #30 (Charlie Range)				
Proposed	Valkaria Sand	Yes	0-1	Jun-Sep
Alternative	Myakka Sand/Valkaria Sand		0.5-1.5/0-1	Jun-Sep/ Jun-Sep

a. Soil series within a 100-foot buffer of light location.
b. Estimated values are based on National Resource Conservation Service Stastgo and South Florida Water Management District national soils landscape positions databases; actual site values may vary with soil type.

There would be no major adverse impacts to soils associated with the installation and maintenance of the proposed and alternative RSLS for the APAFR north and south ranges. The relatively flat topography and the limited loss and anticipated quick recovery of disturbed ground cover plant species minimize soil impact potentials. In addition, the exclusion of vehicular machinery for cutting and/or removing vegetation to establish and maintain light location sightlines also minimizes soil impact potentials. Soil erosion that does occur would be localized and would not likely adversely impact off-site areas.

As shown in Table 4-10, there are light location soil moisture and water table conditions that could result in soil compaction and/or rutting if traveled by vehicles during periods of SHWTs and wet soil conditions. For some locations such as lights #5, #6, #11, and #12, soil impacts would be minimized by selecting sites that avoid hydric soils, whereas other locations require light installations at sites that may have hydric soil moisture regimes and relatively long periods of SHWTs that can range from 4 to 11 months. Avoiding RSLS sites during wet periods, gaining site access using established access roads and firebreaks, and opting to use ATVs to access sites that are estimated to have high or severe vulnerabilities to soil disturbance damage significantly diminishes soil impact potentials. With the exception of proposed Charlie Range light location #18, the soil compaction and rutting damage that could occur would be minimal and localized and of no major consequence to affected soil environments.

Since established road access is not unavailable for location #18, off-road travel over natural ground would be required. It is estimated that access to location #18 would require 0.33 miles of overland travel across a bahia grass (*Paspalum notatum*) pasture. Overland access location #18 may intersect Basinger Sand and Immakkalee Sand soils. Each of these soils is classified as hydric (Table 3-15): SHWTs can range from 0 to 1.5 feet below the surface for 4 to 10 months (Table 4-10): soil compaction vulnerability is estimated to be high to severe (location 18): and soil rutting vulnerability is estimated to be high (Figure 4-2 and Figure 4-3). Overland truck traffic during installation and maintenance (six visits per year) during wet periods and high water tables could result in short-term soil compaction and/or rutting soil impacts. Proposed access to these location using ATVs and/or during periods when water tables are not seasonally high would significantly diminish soil impact potentials.

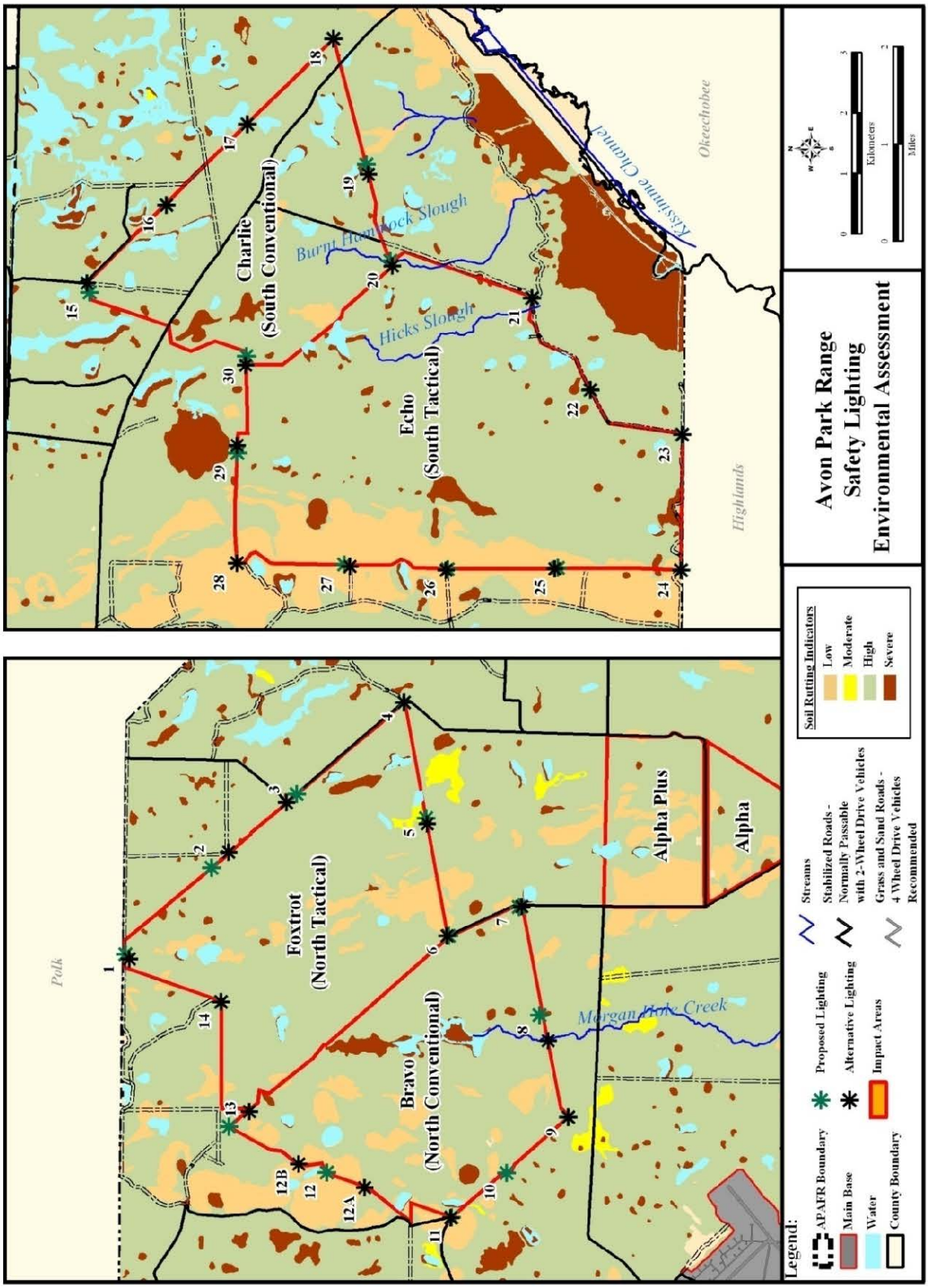

Figure 4-2. North and South Ranges Estimated Soil Compaction Vulnerability

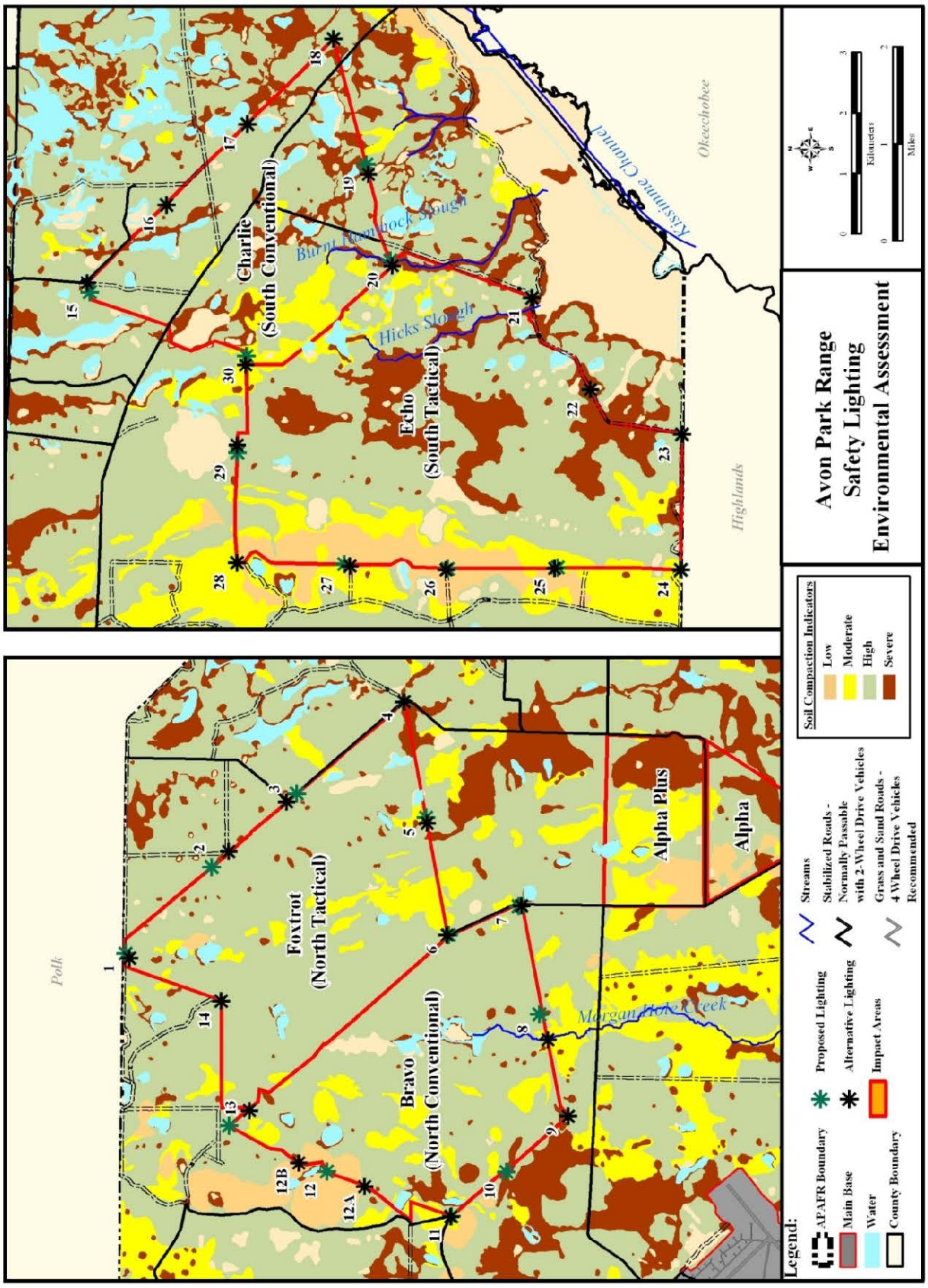

Figure 4-3. North and South Ranges Estimated Soil Rutting Vulnerability

Operation

The operation of the lights would not affect soil resources. Potential soil impacts are only associated with the installation and maintenance of the RSLS.

4.6.2 Alternative 1 – Install Range Safety Lighting System at Alternate Locations

Installation and Maintenance of the Range Safety Lighting System

As with the Proposed Action, there would be no major adverse impacts to soils associated with the installation and maintenance of the Alternative 1 light locations for the APAFR north and south ranges (Table 4-10). In addition, the exclusion of vehicular machinery for cutting and/or removing vegetation to establish and maintain light location sightlines also minimizes soil impact potentials. No RSLS activity soil erosion impact potentials were identified. Some access through hydric soils may be required but wet periods would likely be avoided for maintenance events. Any effects would likely consist of short-term soil compaction and rutting, which could be alleviated by accessing the locations using ATVs.

Operation

The operation of the lights under Alternative 1 would not affect soil resources. Potential soil impacts are only associated with the installation and maintenance of the RSLS.

4.6.3 No Action Alternative

Under the No Action Alternative, the Air Force would not construct lighting features around bombing range boundaries of APAFR. Impacts to soil resources would not be expected under this alternative.

5. CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.1 CUMULATIVE EFFECTS

The CEQ regulations (40 CFR 1508.7) define cumulative effects analysis as "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions."

Cumulative effects may occur when there is a relationship between the Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping or in proximity to the Proposed Action or Alternative 1 can reasonably be expected to have more potential for cumulative effects on "shared resources" than actions that may be geographically separated. Similarly, actions that occur during the same time frame will tend to offer a higher potential for cumulative effects.

In this EA, an effort has been made to identify all actions that are being considered on APAFR and that are in the planning stage at this time. These actions are included in the cumulative analysis to the extent that details regarding such actions exist and the actions have a potential to interact with the Proposed Action or Alternative 1. Although the level of detail available for future actions varies, this approach provides the decision maker with the most current information to evaluate the consequences of the Proposed Action.

Actions that may have potential cumulative impacts include ongoing training missions such as Army National Guard ground and surface-to-surface missile training, natural resource management efforts, controlled burns, species management and forestry, and planned actions such as Navy ordnance training.

Since the No Action Alternative will utilize existing ORMA procedures (Section 2.3 and Appendix A) to address APAFR training safety and operational issues, no adverse cumulative effects to airspace management and safety, water resources, biological resources, anthropogenic resources, or cultural resources are anticipated.

5.1.1 Airspace Management and Safety

Neither the Proposed Action nor Alternative 1 would have cumulative adverse impacts with regard to airspace management and safety when considered with other planned actions such as Navy air-to-ground ordnance training. The Proposed Action and Alternative 1 would both enhance the existing airspace management and safety environment.

5.1.2 Surface Waters, Wetlands, and Floodplains

Neither the Proposed Action nor Alternative 1 would have cumulative adverse impacts with regard to surface waters, wetlands, and floodplains when considered with planned Navy ordnance training or existing Army National Guard ground and surface-to-surface missile training. APAFR management of natural resources and adherence to Section 404 guidelines would prevent cumulative adverse effects to wetlands.

5.1.3 Biological Resources

Disturbance from installation and tree removal associated with site preparation represents a cumulative adverse effect when considered with other types of manmade disturbances, including military training noise, controlled burns, and forestry management. The contribution from the Proposed Action would be minor and not adverse because disturbance would be brief (a few days for tree removal) and limited in area of impact. No active RCW cavity trees, or existing FSJ or FGS nest locations would be affected. RCW foraging area would be decreased in some areas, including forage area that is already at or below USFWS minimum standards required to support an RCW colony. The Proposed Action, combined with other actions, could potentially result in a cumulative adverse impact to those specific RCW clusters that are at or below the minimum standard. Alternative 1 would result in less impact to biological resources than the Proposed Action. As discussed in Chapter 4, effects from the lights to wildlife and protected species would not have a major adverse impact, and in terms of degree of effect are overshadowed by comparison with actions such as live ordnance training. Thus, combined with other past, present, and future actions, neither the Proposed Action or Alternative 1 would have a major adverse cumulative effect.

5.1.4 Anthropogenic Resources

Potential impacts to the dark sky at the FKPP associated with the additional artificial light proposed at APAFR could have a cumulative adverse effect when considered with other activities that require additional artificial night lighting. For instance, the development of the new town of Destiny planned near the northeast border of the park is anticipated to have an adverse impact on the dark night sky at the FKPP. Neither the Proposed Action nor Alternative 1 would have a major adverse cumulative effect on anthropogenic resources.

5.1.5 Cultural Resources

For the project under consideration in this document, APAFR has determined that the alternatives proposed here would result in no adverse effects to cultural resources if recommendations to survey and delineate resources are followed. With the exception of Echo fence line and Bill's Bay area, most of these activities would occur in previously disturbed active impact areas that are not subject to cultural surveys because of an unexploded ordnance hazard. If proposed recommendations are followed, no cumulative impacts to cultural resources would be expected. All actions involving these projects are regulated under AFI 32-7065, *Cultural Resources Management*. The APAFR Cultural Resources office should be consulted on future activities, and information will be provided on a case-by-case basis. If management practices set forth in APAFR's *Integrated Cultural Resources Management Plan* are followed (APAFR, 2008), any potential contribution to cumulative impacts of cultural resources would not be expected.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitment of resources is related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects result primarily from the use or destruction of a specific resource (such as energy or

minerals) that cannot be replaced within a reasonable period of time. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (for example, extinction of a threatened or endangered species or the disturbance of a cultural site).

None of the components of the Proposed Action (the installation or operation and maintenance of the RSLS) or Alternative 1 would constitute an irreversible or irretrievable commitment of resources. Installation and maintenance involve expenditure of minor amounts of fuel by vehicles and tree clearing equipment. Known cultural resources would be avoided, though undiscovered cultural resources could be inadvertently disturbed. With the exception of the removal of some trees, no irreversible or irretrievable commitment of biological resources, including permanent loss of protected species or their habitats is expected.

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6. MANAGEMENT PRACTICES

6.1 VEGETATION CLEARING

- Tree and brush clearing will leave no more than 4-inch high stumps to prevent damage to vehicle undercarriages.

- Trees will be limbed to eliminate ladder fuels, and reduce scorch heights during prescribed burns and wildfires.

- Vegetation removal will be limited to ground level clearing. No roots will be excavated. Any digging would require coordination with APAFR Cultural Resources Management.

6.2 INSTALLATION, MAINTENANCE, AND ACCESS

- The Air Force would wait until the dry season to effect repairs on lights located within wetland areas.

- The Air Force would avoid traveling through soil areas where compaction and rutting could have localized adverse effects, or promoting the introduction and spread of invasive species.

- Protected species management practices will be developed through a process of consultation with the USFWS.

- Bird spikes will be installed on light poles located in proximity to FSJ (*Aphelocoma coerulescens*) and FGS (*Ammodramus savannarum, floridanus*) habitat areas to prevent an artificial increase in available avian predator perching sites.

- No foreign materials (for example, clay, shell, yellow sand) would be utilized for road or access improvements.

- Cultural resource surveys will be conducted prior to excavations at potential site locations where surveys have not been previously conducted (Table 3-13). The APAFR Cultural Resource Manager will be onsite to oversee the excavation of the holes dug for the lights along the west side of Echo Range.

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8. PERSONS AND AGENCIES CONTACTED

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APPENDIX A
OPERATIONAL RISK MANAGEMENT ASSESSMENT

OPERATIONAL RISK MANAGEMENT ASSESSMENT
AAGTC

Identification Lighting

Introduction

New training requirements for smart bombs have greatly expanded footprints and more use of tactical ranges. AFI 13-212, para 4.15.2, requires Class A and B ranges to have Identification Lighting that support night operations. Lights must have available a distinctive pattern of lights visible by aircrews, with and without NVDs, to ensure positive orientation and identification of the range and target area. These lights should be readily identifiable but not so as to distract aircrews during weapons delivery or wash out target locations. ROAs will ensure that no similar pattern of lights exists near the range that could be misidentified as targets or the Impact Area, but cultural lighting inside or outside the range boundary may serve as a portion of the distinctive pattern of lights. Class B ranges that support night operations will have lighting as described above unless the ROA has determined that the lighting is not required based on a documented, ORM analysis (based on range size, remoteness, etc.). The purpose of this ORM is to set procedures if lights are not installed.

STEP 1: IDENTIFY THE HAZARD

Class B Range operations are conducted without a distinctive pattern of lights visible by aircrews, with and without NVDs, that ensures positive orientation and identification of the range and target areas in support of night operations. These lights should be readily identifiable but not so as to distract aircrews during weapons delivery or wash out target locations. ROAs will ensure that no similar pattern of lights exists near the range that could be misidentified as targets or the Impact Area, but cultural lighting inside or outside the range boundary may serve as a portion of the distinctive pattern of lights.

Action 1 –Mission/Task Analysis

Man: Pilots must rely on in-flight aircraft systems, Weapons Danger Zone (WDZ) target/ordnance data and Range Operations Control Center (ROCC) control to ensure positive orientation and identification of the range and target areas in support of night operations. Human error is possible but there are multi-checks verified before weapon delivery is authorized.
Machine: Pilots are only as good as their in-flight aircraft systems combined with WDZ/ROCC data to ensure positive orientation and identification of the range and target areas in support of night operations. There is great dedication

and determination to ensure air and ground equipment and data exceed operational requirements.
Management: Managers ensure directives are strictly adhered to and provide pilots with current target and range coordinates. There are in-place directives when ordnance is released or discovered off-range.
Quality Control functions: Review and inspect processes and procedures.

Mission Process Review:

Pre-Operations
1. Follow AF Instructions
2. Pre-coordinate range use, ordnance and targets with scheduled pilots via scheduling and/or telephone/email
3. Pre-coordinate range use, ordnance and targets with scheduled pilots upon range check-in via UHF/VHF radios
4. Close off areas on-range that are identified in the WDZ footprint.

Operations
1. Monitor range use, ordnance and targets with scheduled pilots via UHF/VHF radios and FAA radar feeds (SAS and RADS)
2. Pilots report off-range releases
3. Pilots report on or off-range wildfires.

Post Operations
1. Verify range use, ordnance and targets with scheduled pilots upon range departure via UHF/VHF radios

Action 2 –List Hazards
1. Release of off-range ordnance.
2. Off range areas are not restricted and have full public access. With public access, life and/or limb and public property could be injured/destroyed.
3. Off range woodlands/grass fires
4. Damage to the environment

Action 3 –List Causes
1. In-flight aircraft systems malfunction.
2. Pilot error
3. Ordnance malfunction
4. WDZ errors
5. ROCC error
6. Lack of range identification lights

STEP 2: ASSESS RISK

Probability, severity and exposure of a mishap are unlikely. Risk level is negligible.

Action 1 –Assess Hazard Exposure

There have been a total of 47,084 sorties since FY 2005. No off-range bombs have been recorded during the same period. No off-range fire or public exposure has been caused from bombing range activity since FY 2005.

Action 2 –Assess Hazard Severity

Risk level is negligible. Advance targeting systems and WDZ data strictly control ordnance release and greatly enhance statistical data for zero off-range releases. Consideration of the "what if" probability that if a problem occurs is already addressed in governing regulations. Procedures are in-place to recover any off-range ordnance, react to medical emergencies, protect public property and respond to wildfires or any environmental hazard. Installation of lights will provide one added procedure to allow users to physically identify range boundaries. If targeting systems were aligned outside the impact area, pilots would easily be able to qualify that there is a problem with coordinates.

Action 3 –Assess Mishap Probability

With multiple aircraft checks to identify targets, WDZ data and ROCC verification, Mishap probability is highly unlikely. Without lights, the Indian Lake Estates (located within 2 miles of the North Tactical Range boundary is marked by its own internal street lights. The River Ranch Resort airfield, NE corner of the Restrict Area, has frequency controlled lights. Installation of perimeter lights would need to highly differentiate between range and off-range lighting systems.

Action 4 –Complete Risk Assessment

Severity is negligible and probability is low.

STEP 3: ANALYZE RISK CONTROL MEASURES

Action 1 –Identify Control Options

Use avoidance as the main risk control option.

Action 2 –Determine Control Effects

Following directives enforces direct control.

Action 3 –Prioritize Risk Controls

Risk is categorized as Low. AFI and weapons procedures are in-place and strongly enforced. Effective control measures reduce or eliminate all of the three components (probability, severity, or exposure) of risk.

STEP 4: MAKE CONTROL DECISIONS

Action 1—Select Risk Controls.

Follow current directives.
Perform recurring footprint checks
Strictly monitor day-to-day operations
Perform annual and spot-check quality inspections
Perform supervisor spot-checks.

Action 2—Make Risk Decision.

Risk level is low.

STEP 5: IMPLEMENT RISK CONTROLS

Action 1—Make Implementation Clear.

Ensure flying squadrons follow range guidelines. All new users receive a range brief including off-range releases. ROCC personnel are well trained to brief/monitor guidelines. Quick Reaction Checklists are in-place for all situations. The AAGTC CC/DO, Environmental Flight Chief, FSSI Ground Operations and Rescue Operations personnel are immediately contacted for any off-range situation.

1. Review procedures for off-range ordnance release with users.
2. If the DO/Commander directs lights installation, new procedures will be briefed to users and ROCC personnel.
3. Review of governing directives with all ROCC employees.
4. Approval of the ORM by the AAGTC DO and Commander.

Action 2—Establish Accountability.

1. The final responsibility belongs to the AAGTC DO and Commander.
2. ROCC accepts responsibility to implement the DO and Commanders directives.

Action 3—Provide Support.

1. Once the Commander approves the ORM, current directives will continue to be implemented.
2. The AAGTC DO will receive immediate feedback on any problem areas within the entire program. Additionally, he will review all documented inspections.
3. The DO will keep the Commander knowledgeable of the status, any changes or any other pertinent information about the program.

STEP 6: SUPERVISE AND REVIEW

Action 1—Supervise.

Supervisors will monitor the operation to ensure controls are effective and remain in place. Any changes which require further risk management actions will immediately be reported the DO and Commander. Action will be taken when necessary to correct ineffective risk controls and reinitiate the risk management steps in response to new hazards.

Action 2—Review.

ROCC personnel will monitor day-to-day operations and immediately report mishaps to the Site Manager and DO.

Action 3—Feedback.

Any off-range event will be documented on the ROCC events log. A trend analysis will be conducted on these logs. Any negative trends will be immediately reported.

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APPENDIX B
AIR FORCE FORM 813

Appendix A, FA4890-04-D-0004, Control #702

REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS

Report Control Symbol RCS: 0807280

INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).*

SECTION I - PROPONENT INFORMATION

1. TO (Environmental Planning Function)	2. FROM (Proponent organization and functional address symbol)	2a. TELEPHONE NO.
23 Wing Det 1 OL-A Avon Park AFR Fl 33825	23 Wing Det 1/DO 45 South Blvd Avon park Fl 33825	863-452-7260

3. TITLE OF PROPOSED ACTION
Range Safety Lighting System (RSLS)

4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)*
RSLS is used to provide a visual boundary of the gunnery range to pilots from the ground.

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)*
See attachment

6. PROPONENT APPROVAL (Name and Grade)	6a. SIGNATURE	6b. DATE
Richard Cutshall GS-12	RCCutshall	20080708

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental effects including cumulative effects.) (+ = positive effect; 0 = no effect; - = adverse effect; U= unknown effect)*

	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*	☐	☐	☐	☑
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.)*	☐	☑	☐	☐
9. WATER RESOURCES *(Quality, quantity, source, etc.)*	☐	☑	☐	☐
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity-distance, bird/wildlife aircraft hazard, etc.)*	☐	☐	☐	☑
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)*	☐	☑	☐	☐
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, threatened or endangered species, etc.)*	☐	☐	☑	☐
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*	☐	☐	☐	☑
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)*	☐	☑	☐	☐
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)*	☐	☑	☐	☐
16. OTHER *(Potential impacts not addressed above.)*	☐	☑	☐	☐

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17. ☐ PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR
☑ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS
See continuation sheets for details for further environmental analysis. – recommend contracted EA.

19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION (Name and Grade)	19a. SIGNATURE	19b. DATE
PAUL T. GRASSBACH, YF-02 Chief, Environmental Flight		25 Aug 08

AF FORM 813, 19990901 *(IMT-V1)* THIS FORM CONSOLIDATES AF FORMS 813 AND 814. PREVIOUS EDITIONS OF BOTH FORMS ARE OBSOLETE. PAGE 1 OF 10 PAGE(S)

AF FORM 813, SEP 99, CONTINUATION SHEET

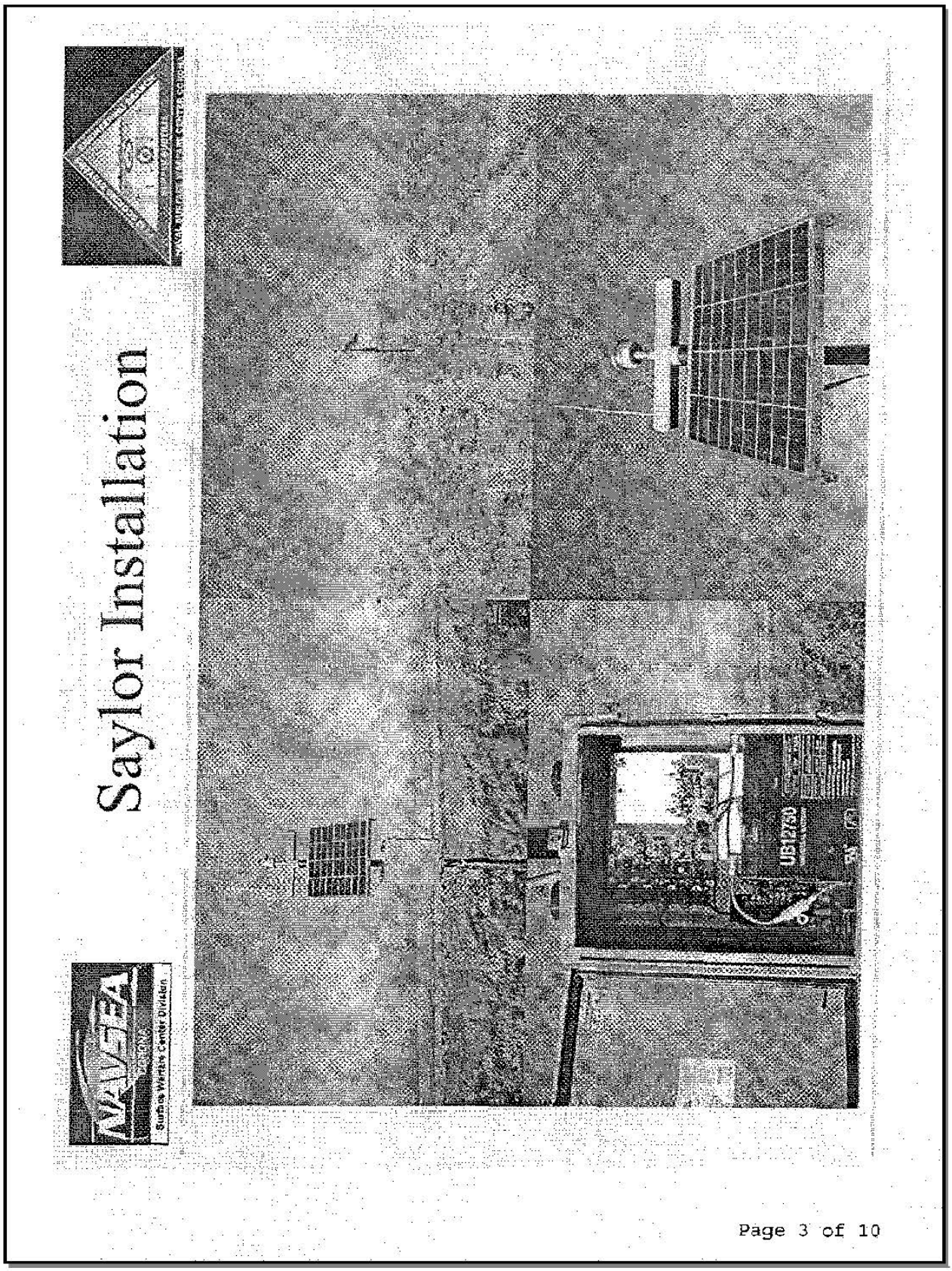
RSLS equipment consists of a NEMA 4 enclosure that houses multiple electronic circuit boards as well as a sealed 12V battery, a solar panel, a LED light, and an IR light. Avon Park North range is slated for 15 of these units and the South range is slated for 18 of these units. The RSLS units are mounted on top of a 2" diameter pole that measures approximately 10 feet tall. The pole is set in ground with cement.

- The lights will only be on when that range is being used at Night. This averages about 2 nights a week.

- The lights can be moved or placed to avoid impacts

Dick

(IMT-V1) PAGE 2 OF 10 PAGE(S)


Saylor Installation
Page 3 of 10

AF IMT, SEP99, CONTINUATION SHEET

SECTION I – PROPONENT INFORMATION

5. DESCRIPTION OF PROPOSED ACTION AND ALTNERNATIVES
The lights would be on only during night time training operations, about two nights per week.

The location of the lights is somewhat flexible so that some impacts could be avoided.

SECTION II – PRELIMINARY ENVIRONMENTAL SURVEY

9. WATER RESOURCES
Due to extensive areas of wetlands, construction of some lights would be in wetlands. Coordination and permitting with the United States Army Corp of Engineers would be required.

Due to extensive floodplains, some of the lights would be constructed in floodplains resulting in the NEPA document being signed at the command level.

12. BIOLOGICAL RESOURCES
Some lights would be constructed within red cockaded woodpecker nesting cavity tree communities and Florida scrub-jay nesting territories. These are federally listed as threatened bird species. The placement of the lights, as well as illuminating these communities and territories would require either informal or formal consultation with the United States Fish and Wildlife Service.

Night migrating birds have been show to be attracted and disoriented by visible red lights and strobe lights. Granted, the Proposed Action would not use this type of lighting, however, the effects of LED lights and IR needs a literature search to determine the impacts.

The LED lights are fairly certain to attract nocturnal insects and attract night feeding bats and birds.

Some lights would be placed in areas that have federally listed, threatened or endangered plants. However, on-site field inspections of where the lights would specifically be placed may result in avoiding these plant species.

The lights would not be damaged during prescribed burns because enough control measures would be in place. Wildfire suppression lacks these control measures and some lights would likely be damaged or destroyed during wildfires, particularly in brushy areas.

Some trees will likely need to be removed for visibility.

PAGE 4 OF 10 PAGE(S)

AF IMT, SEP99, CONTINUATION SHEET

13. CULTURAL RESOURCES
Several of the lights would be placed in areas that have not been surveyed for cultural resources. If the lights are located outside of the impact areas, then surveys would need to be conducted and consultation conducted with the SHPO and tribes. If the lights are located inside the impact areas, no survey or consultations would be required.

15. SOCIAL ECONOMICS
Lights on the north border of the installation will in all likelihood be vandalized continuously.

16. OTHER
The following are suggestions to consider for the design of the lights with regards to the Florida environment:

- Suggest lightening arrestors be installed near each light.
- Place each light close to the perimeter fence line to take advantage of disked fire breaks. Avoid placing the light in the fence line directly as a lightening striking the barbed wire fence could be conducted to the light.
- Use galvanized poles to mount the lights on because the acidic soils and ground water corrodes metals quickly.
- The light control box has a fan that circulates air when the internal components reach a certain temperature. Suggest turning the fan off remotely if possible during wildfires because radiate heat outside the box would be pulled in by the fan.
- The box that houses the electronic components is plastic. Recommend it as well as conduit and fittings to be metal to avoid melting from wildfires.
- How well will the electronics hold up under high heat and humidity? Possible to design for these conditions?
- Suggest that the remote radio programming for the lights be done through a repeater tower because radio-to-radio transmission can be limited, especially if swamps with dense cypress or bay trees are between the transmitting and receiving radios.

SECTION III – ENVIRONMENTAL ANALYSIS DETERMINIATION

18. REMARKS

An environmental assessment (EA) is recommended. Categorical exclusion A2.3.14 *Installing on previously developed land, equipment that does not substantially alter land use,* was briefly considered because the light equipment would be placed within land previously developed by fire breaks and fence lines and even with the addition of lights, the impact ranges would still function for ordnance and gunnery deliveries. However, the fact that light would be produced in areas that have historically received little or no artificial illumination was considered as possibly being a significant

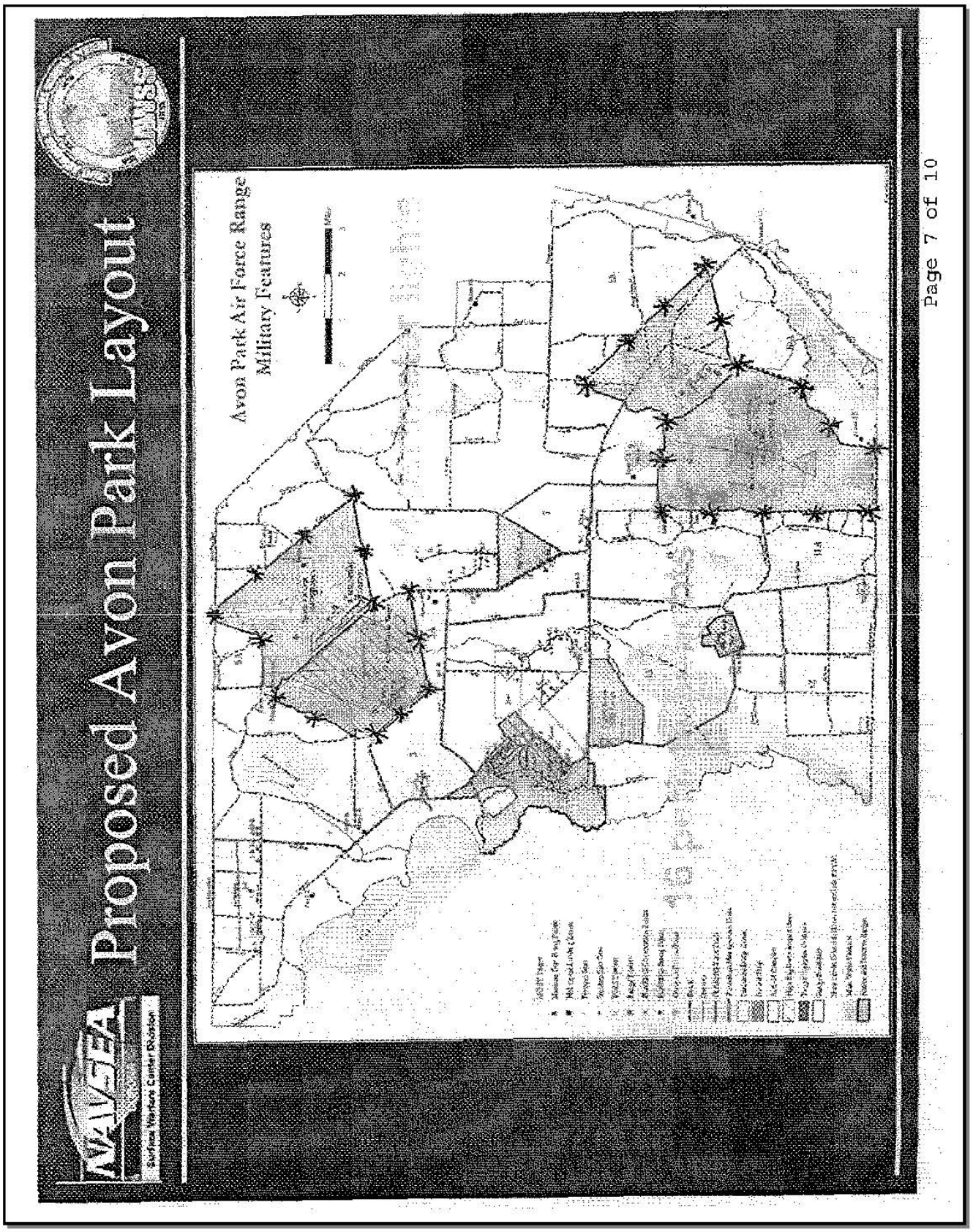
PAGE 5 OF 10 PAGE(S)

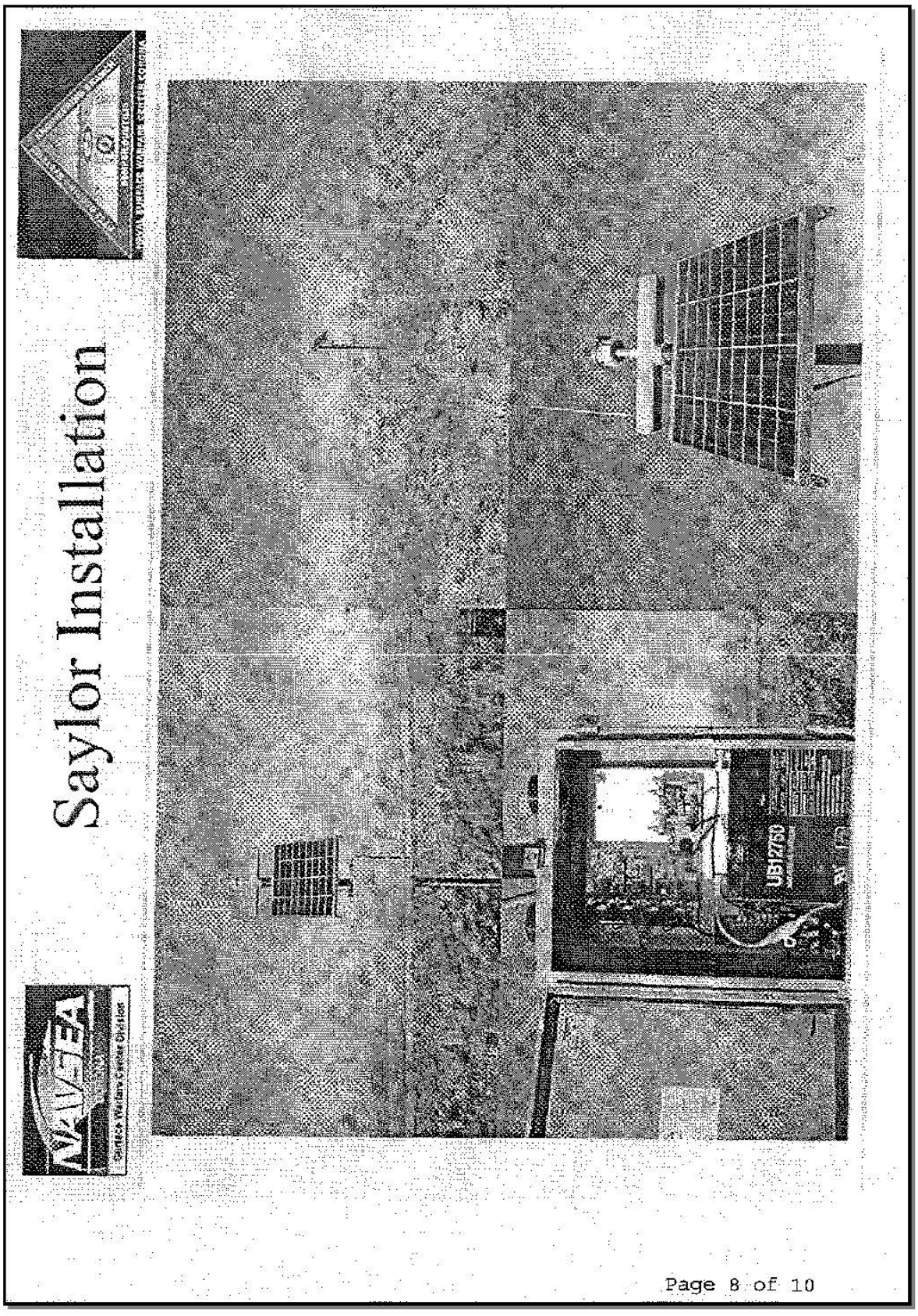
AF IMT, SEP99, CONTINUATION SHEET

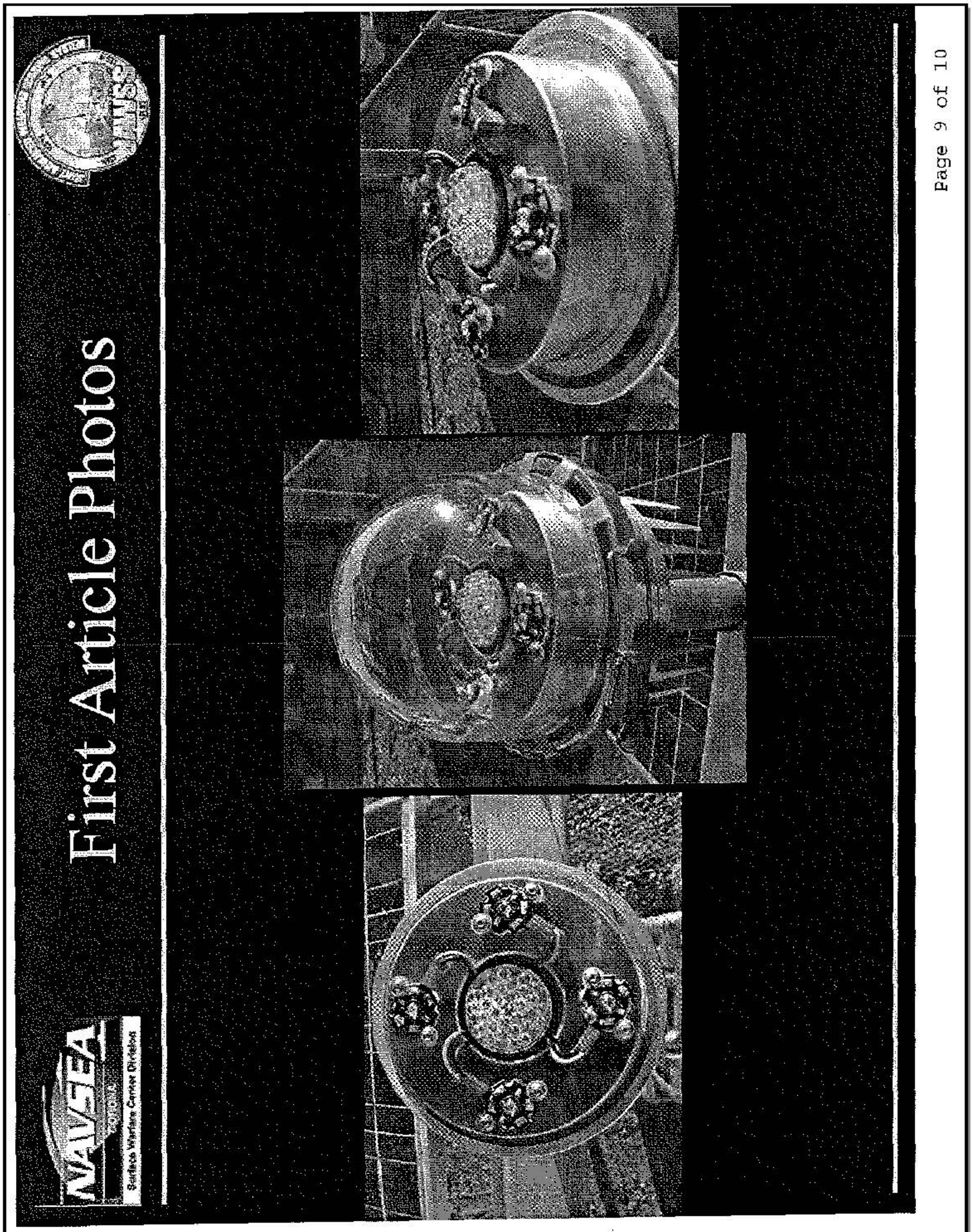
impact to the environment and therefore would best pursued at the next higher level of NEPA analysis, the EA.

The Environmental Flight staff was not knowledgeable on the science of light and therefore unable to confidently determine the impacts on nocturnal creatures, day time creatures, and on people. This uncertainty contributed to the recommendation for an EA in an effort to better understand the illumination characteristics of the proposed lighting system as well as understanding the impacts, with expected responses, of the various receptors. The recommendation is made for the EA to be contracted to a firm that is knowledgeable on the science of light and can assess the impacts to various receptors.

PAGE 6OF10PAGE(S)


Proposed Avon Park Layout
NAVSEA
Surface Warfare Center Division
Avon Park Air Force Range
Military Features
Page 7 of 10


Saylor Installation
Page 8 of 10


First Article Photos
NAVSEA
Surface Warfare Center Division
Page 9 of 10

Questions regarding lighting for the north and south range complexes at APAFR.

1. What is the size of the concrete base for the poles? Unknown Given the loose soils and occasional heavy winds, I would anticipate that they will need a fairly substantial concrete base. This will directly relate to the amount of ground disturbance for each light.

2. I need accurate locations for the lights, ArcView shapefile preferred, UTM accepted. If they cannot provide this, then I will need an area, drawn on a map at an appropriate scale, within which they will be located. Unknown. AFI 13-212 instructs range corners to be marked.

3. Are the locations of the lights determined by regulations, or are they approximate distances apart? Unknown How firm are the points they want to put the lights? Unknown Is there any leeway on their location so they can be moved out of archaeologically sensitive areas? Unknown.

4. This action will require a SHPO and Tribal Consultation. If I have accurate locations, an additional survey will not likely be required. However, if I am only given approximate areas on a map, which will constitute a larger area that could potentially be affected.

5. Will the lights be placed within the impact areas (inside the fence) or outside the impact areas (outside the fence)? Unknown, however, map indicates outside the fence.

6. What would the site preparation entail? Unknown. Would vegetation need (including trees) to be cleared around each light? Would the area around each light need to be mowed or disked to avert wildfire damage?

7. How high would the lights be? Ten feet high. Are lightening arresters part of the design, and if so, would the arresters be higher than the lights? No lightening arresters in design. Units do have antennas for radio programming. If so, how high?

8. Would the lights be on every evening or on only when night training activities occur? Unknown, however, light settings are in 2,4,6,8, and 24 hour settings and can be set and reset remotely by radio. If only during night training activities, how frequently would they be on? Unknown.

9. AFI 13-212 instructs impact range perimeter lighting for Class B ranges when an ORMA determines the need for lighting. Was an ORMA conducted for these ranges? If so, can the ORMA be supplied for the 813 review? Unknown.

10. Alpha Plus and Oscar ranges are omitted from this proposal. Was this intentional? Unknown.

Page 10 of 10

APPENDIX C
RANGE SAFETY LIGHTING SPECIFICATIONS

Attachment C-1. Range Safety Lighting System Specifications.

Self-contained, Narrow-Band VHF/UHF DTMF Controlled Bombing Range Lighting System

- Solar Powered
- Designed to comply with AFI 13-212 requirements for perimeter lighting
- Four 505nm Green LEDs for high visibility, yet invisible to NVG operations
- 850nm IR LED cluster for NVG visibility
- Visible out to a range of 10 nautical miles
- Wide variety of lighting options from steady-on to flashing either green, IR or both
- Other LED color options available for target lighting, etc.
- High-quality components:
    - State-of-the-art controller board with embedded DTMF decoder
    - Quality machined components
    - Luxeon V Star LEDs (green)
    - LEDtronics LED cluster (IR)
    - Hamtronics radio receiver
    - Kyocera 65-Watt solar panel
    - Morningstar charge controller
    - UB12750 75 Amp-Hr sealed lead acid battery
    - Crouse-Hinds lens cover
    - NSL-6110 CdSe photocell to preclude daytime operation
    - Mountain brass padlock (keyed alike) for NEMA enclosure

Component Specifications

(1) Controller Board RSLS-CCRMB-V3A @ 16mA standby/32mA RTR/52mA per relay
(4) Luxeon V-Star LHXL-LE5C (green @ 505nm) @ 700mA each
(1) LEDtronics 30-LED Base Bulb B630-850-014W (IR @ 850nm) @ 175mA
(1) Hamtronics R-302/R-305 FM Receiver @ 100mA
(1) Vantec SF8025L 80mm double ball bearing cooling fan @ 100mA (T>100° F)

For more information, please contact NSWC Corona (Eric Schreiner) at 951.273.5032

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APPENDIX D

COASTAL ZONE MANAGEMENT ACT DETERMINATION

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

January 6, 2010

Mr. W. Jamie McKee, Project Manager
Science Applications International Corp.
1140 North Eglin Parkway
Shalimar, FL 32579

RE: Department of the Air Force – Draft Environmental Assessment for the Installation of a Range Safety Lighting System at Avon Park Air Force Range – Polk and Highlands Counties, Florida.
SAI # FL200911235031C

Dear Mr. McKee:

The Florida State Clearinghouse has coordinated a review of the Draft Environmental Assessment (EA) under the following authorities: Presidential Executive Order 12372; Section 403.061(40), *Florida Statutes*; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

Based on the information contained in the Draft EA and comments provided by our reviewing agencies, the state has determined that the proposed activity is consistent with the Florida Coastal Management Program.

Thank you for the opportunity to review the proposed project. Should you have any questions regarding this letter, please contact Ms. Lauren P. Milligan at (850) 245-2170.

Yours sincerely,

Sally B. Mann

Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/lm
Enclosures

Project Information	
Project:	FL200911235031C
Comments Due:	12/29/2009
Letter Due:	01/06/2010
Description:	DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT FOR THE INSTALLATION OF A RANGE SAFETY LIGHTING SYSTEM AT AVON PARK AIR FORCE RANGE - POLK AND HIGHLANDS COUNTIES, FLORIDA.
Keywords:	USAF - INSTALL RANGE SAFETY LIGHTING SYSTEM, AVON PARK AFR - POLK/HIGHLANDS CO.
CFDA #:	12.200
Agency Comments:	
FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION	
No Comments	
STATE - FLORIDA DEPARTMENT OF STATE	
No Comment/Consistent	
ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION	
No Comments	

For more information or to submit comments, please contact the Clearinghouse Office at:

3900 COMMONWEALTH BOULEVARD, M.S. 47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

Visit the Clearinghouse Home Page to query other projects.

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COUNTY: ALL
SCH - USAF - AP
2009 - 6812

DATE: 11/23/2009
COMMENTS DUE DATE: 12/29/2009
CLEARANCE DUE DATE: 1/6/2010
SAI#: FL200911235031C

MESSAGE:

STATE AGENCIES	WATER MNGMNT. DISTRICTS	OPB POLICY UNIT	RPCS & LOC GOVS
ENVIRONMENTAL PROTECTION			
FISH and WILDLIFE COMMISSION			
X STATE			

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is categorized as one of the following:

_ Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.

X Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.

_ Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.

_ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT FOR THE INSTALLATION OF A RANGE SAFETY LIGHTING SYSTEM AT AVON PARK AIR FORCE RANGE - POLK AND HIGHLANDS COUNTIES, FLORIDA.

To: Florida State Clearinghouse

AGENCY CONTACT AND COORDINATOR (SCH)
3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

EO. 12372/NEPA
☑ No Comment
☐ Comment Attached
☐ Not Applicable

Federal Consistency
☑ No Comment/Consistent
☐ Consistent/Comments Attached
☐ Inconsistent/Comments Attached
☐ Not Applicable

From:
Division/Bureau: Division of Historical Resources, Bureau of Historic Preservation
Reviewer: Edwards, Scott — Laura A. Kammerer, Deputy SHPO
Date: 12-1-09 — 12.02.09

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2009 NOV 25 P 2:10
BUREAU OF HISTORIC PRESERVATION

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DEP Office of Intergovt'l Programs

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APPENDIX E

U.S. FISH AND WILDLIFE SERVICE CONSULTATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

April 9, 2010

Charles E. MacLaughlin
Lieutenant Colonel
Department of the Air Force
OL A, Det 1, 23 WG/CEVN
Avon Park Air Force Range, Florida 33825

Service Federal Activity Code: 41420-2009-FA-0639
Service Consultation Code: 41420-2009-TA-0560
Date Received: February 4, 2010
Project Name: Avon Park Air Force Range Range Safety Lighting System
Applicant: Department of the Air Force
County: Polk/Highlands

Dear Colonel MacLaughlin:

Per your request in the memorandum dated January 26, 2010, the South Florida Ecological Services Office of the U.S. Fish and Wildlife Service (Service) has completed a review of the Biological Assessment (BA) for the Avon Park Air Force Range (APAFR) Range Safety Lighting System (RSLS). This letter is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.)

PROJECT DESCRIPTION

The applicant proposes to install 30 solar-powered light sources around the north (FoxtrotBravo) and south (Charlie/Echo) range complexes. Each will be mounted on a 10-foot pole, positioned at selected locations along the range perimeters. Locations were chosen through a process of exclusionary mapping and field verification to minimize environmental impacts. The light source would be multiple light-emitting diodes (LED) encased in a clear dome. The diodes would emit both infrared and green light, and each unit would emit 120 lumens of steady or unblinking visible light in the green spectrum and invisible infrared light. The purpose of the project is to adequately illuminate the boundaries of the north and south range complexes for pilots conducting training missions during non-daylight hours. The project site is located within the boundaries of the APAFR in Polk and Highlands Counties, Florida.

TAKE PRIDE IN AMERICA

THREATENED AND ENDANGERED SPECIES

Florida grasshopper sparrow

The Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) (FGS) is federally and state-listed as endangered, with loss of habitat the primary reason for population decline (Service 1999). The FGS is endemic to the south-central dry prairie region of the state. FGS habitat is characterized as flat, treeless, fire-dependent grasslands with scattered shrubs (U.S. Air Force 2000a). Since 1997, the FGS population at APAFR has declined by over 93 percent, from an estimated 298 birds to 12 birds in 2007 (Tucker et al. 2008). The population of the FGS at APAFR has remained stable since 2003; however, it is at risk of extirpation, and intensive management is required to ensure the continued existence of this species at APAFR (Tucker et al. 2008). Suitable FGS habitat is found near light locations #18 through #22 along the eastern edge of Charlie/Echo Ranges and light locations #6, #7, and #8 along the edge of Bravo Range. FGS habitat may be potentially affected by RSLS installation at the eight proposed light locations mentioned above. Since each lighting unit is self-contained and independently powered, noise and disturbance would be confined to the immediate area where the light pole would be placed. In order to reduce the potential for light poles to become predator perches, bird spikes will be installed and maintained at light locations #18 through #22 within FGS habitat in Echo Range. Power augers, chain saws, and vehicles would create brief noise disturbances during the installation and could temporarily affect this species. Given that the actual area to be cleared for installation of each light pole will be small, the disturbance associated with the installation will be temporary, and in light of the placement of bird spikes to discourage avian predators, the Service concurs with the AFAFR's determination that the project may affect but is not likely to adversely affect the FGS.

Florida scrub-jay

The Florida scrub jay (*Aphelocoma coerulescens*) (FSJ), a federal and state-listed threatened species, is declining due to residential, commercial, and agricultural development; altered fire regimes; and disease (Service 1999). The primary cause of nest failure in the FSJ is predation, which accounts for 67 percent of egg loss and 85 percent of nestling loss (Schaub et al. 1992). The FSJ is very specialized, inhabiting fossil dune ridges vegetated with xeric (subsisting on little water) oak scrub for nesting and foraging (Bowman et al. 2009). One such ridge, formed during the late Pleistocene, runs primarily north-south through the center of APAFR and supports four distinct regions of subpopulations of the FSJ. The four regions of the FSJ at APAFR are identified as North Ridge, South Ridge, Isolated, and River. Two of these, the North Ridge and South Ridge populations, are directly relevant to the project area, with stable habitat or territories located along some sections of range perimeters where lighting would be installed. FSJ habitat may be potentially affected by RSLS installation at light locations #6, #10, #11, and #28. Since each lighting unit is self-contained and independently powered, noise and disturbance would be confined to the immediate area where the light pole would be placed. Power augers, chain saws, and vehicles would create brief noise disturbances during the installation and could temporarily affect this species. While tree clearing in the vicinity of the lights may be needed, no clearing of oak scrub will be necessary for installation. In addition, as

referenced above, bird spikes will be installed and maintained at light locations #6, #10, #11, and #28 within FSJ habitat to discourage perching by avian predators. Given the actual area to be cleared for installation of each light pole will be small, the disturbance associated with the installation will be temporary, and bird spikes will be installed to prevent long-term use by FSJ predators, the Service concurs with the APAFR's determination that the project may affect but is not likely to adversely affect the FSJ.

Red-cockaded woodpecker

The Red-cockaded woodpecker (*Picoides borealis*) (RCW) is federally listed as endangered and state-listed as threatened. RCWs inhabit open, mature pine forest in the southeastern United States and prefer to nest in mature longleaf pines (Service 1999). RCW populations at APAFR are considered stable, being relatively unchanged from 1970s populations. Clusters are spread over the entire range with concentrated areas in the north-central/northwest, northeastern, and eastern parts of the range (US Air Force 2000a). Currently, there were 38 managed clusters at APAFR that supported 27 RCW groups. Managed clusters are active or inactive natural or recruitment clusters that supported at least four cavities in good condition, providing suitable conditions for occupancy. Unmanaged clusters lack suitable trees, are highly isolated, and unlikely to be reoccupied without intensive management (Bowman et al. 2009a). With regard to the proposed action, the Foxtrot Range perimeter, particularly the north area between APAFR and River Ranch acres, supports several RCW active and inactive clusters. An active recruitment area and active clusters are located near the west Bravo perimeter, though not directly on it. An active cluster is located approximately 0.25 mile from the Charlie Range east perimeter. The nearest active tree is over 100 meters from the nearest RSLS light. No RCW cavity trees would be removed during the clearing activities for RSLS installation.

Foraging area may be affected by the removal of trees at a few proposed light locations. The South/Central Florida Recovery Unit Foraging Guidelines for Satisfying the Standard for Managed Stability for RCWs (Service 2006) were used as the basis for determining effects of pine removal on RCW. Under these guidelines, each breeding pair of RCW must have at least 75 acres of foraging habitat, consisting of stands of native long-leaf pine, native slash pine, or planted pine of either species, within 0.50 mile of the cluster epicenter. A minimum of 3,000 square feet of pine basal area must be available within these stands, at least 2,000 square feet of which must consist of pines greater than 9 inches diameter at breast height (DBH). The remainder can consist of pines between 4 inches and 9 inches DBH. According to the BA prepared by the APAFR, lights #1, #2, #13, #14 and #17 are within RCW foraging habitat; however, they either require no tree clearing or tree clearing will not significantly reduce the quality of the habitat. Even though a process of exclusionary mapping was carried out to reduce effects to RCW, the small removal of foraging habitat is unavoidable. Tree removal has the potential to affect RCW forage habitat in clusters 7 and 54. Cluster 7 currently has 150 acres of foraging habitat and has the minimum allowable basal area of forage (2,000 square feet) for pines greater than 9-inch DBH. Twenty square-feet of basal area of pines greater than 4-inch DBH will be removed to provide necessary visibility angle. This amount is less than 1 percent of available resources for cluster 7. Cluster 54 currently has 2,600 square-feet of pines greater than nine inches DBH but falls short of the total forage requirement (3,000 square feet for pine greater

than 4 inches DBH). Pine removal from Cluster 54 will amount to 3 square-feet of basal area, less than 0.1 percent of the available resources for that cluster. It is anticipated the loss in both cluster 7 and 54 will be temporary and natural growth and recruitment of seedlings and saplings into the forage base will compensate for this short-term reduction.

During installation, land clearing, machinery operation, and construction may disturb RCW individuals or populations. Foraging RCWs may avoid areas where construction is occurring; however, installation would only last a few days and disturbance should be minor. RCWs can acclimate to excessive noise levels and adapt to noise associated with military missions and ground operations (Delaney et al. 2002). According to the BA prepared by APAFR, potential disturbances during construction and maintenance would be short term and a small increase in human traffic during maintenance and repairs for the RSLS will not likely affect RCWs nearby. Based on the above analysis, the Service concurs with the APAFR's determination that the project may affect but is not likely to adversely affect the RCW.

Eastern indigo snake

The eastern indigo snake (*Drymarchon corais couperi*) is federally and state-listed as threatened. This snake attains lengths of eight feet, is blue-black in coloration, and is non-venomous. Indigo snakes are known to use gopher tortoise burrows to escape weather extremes. Loss of habitat and decline in gopher tortoise populations are the leading causes in the decline of eastern indigo snake populations. Approximately 50,000 acres of APAFR are upland communities serving as potential habitat to the eastern indigo snake. These communities include oak scrub, pine plantation, oak hammock, pine flatwoods, sand pine scrub, dry prairie, hardwood swamp, wetlands, and disturbed areas. Several confirmed sightings have occurred on or near roads (Bridges 2004). The RSLS lights would be directed upward. It is unknown whether the outward diffusion of light from the RSLS would be sufficiently intense enough, or within close enough proximity, to cause disorientation for indigo snakes. The RSLS will also emit infrared light, which is detectable by some species of snakes from the pit viper family. It is unknown if indigo snakes can detect infrared light. Since the RSLS lights would be elevated approximately 10 feet above the ground, attraction is not likely to be a concern for these snakes. APAFR will implement Service standard protection measures of eastern indigo snake (Service 2004). As such, the Service concurs with the APAFR determination that the proposed action may affect, but is not likely to adversely affect the indigo snake.

Plants

Pigeonwing (*Clitoris fragrans*), a federally threatened species, is an erect perennial herb belonging to the pea family. Pigeonwing occurs in scrub vegetation, turkey oak barrens, and at least at the edges of high pine. Lewis and Stout (2005) studied the life history and local distribution of pigeonwing at APAFR for 3 years, providing the first quantitative data on these characteristics for this species. They examined uniquely marked individuals on seven permanent transects at APAFR weekly from March until September or October. They found the frequency and survivorship of the two flower types, seed production and predation, and yearly survival of individuals vary with the season and frequency of fire events.

Wireweed (*Polygonella basiramia*), a federally threatened species, is a short-lived, perennial, taprooted herb that flowers for one or more years and does not often live beyond the third year. The habitat and life cycle requirements of wireweed have been more widely studied than those of pigeonwing. Wireweed is nearly restricted to the Florida scrub community of south-central Florida. In many places, wireweed grows along fire breaks, disk lines, and roads at APAFR.

Installation of the RSLS will require the clearing of trees and shrubs at some of the light locations to allow personnel access to the lights and a clear line of sight by pilots. Analysis of available plant information indicates that wireweed and pigeonwing are located within 500 feet of several light locations. These plants will potentially be susceptible to direct impacts from equipment/vehicles during installation and maintenance of the RSLS. Lights #24, #25, and #26 will be accessed on existing roads to avoid protected plant species. Impacts to wireweed at Light #12B may be unavoidable because the only access route to the light location will be down the disk line, where the plants are growing. This area is maintained by disking once or twice annually. According to the BA prepared by APAFR, the periodic disking actually encourages site conditions for wireweed, and the fire break helps to maintain a stable population. The plant grows in the disk line and cannot be avoided; however, the plant is an annual and recovers quickly. To reduce the risk of invasive plant colonization, no foreign road material (clay, shell, yellow sand, etc.) be used for access road maintenance. Installers will coordinate with APAFR Natural Resources personnel to avoid driving over rare plants in areas with no established roads. The APAFR RSLS will be an intermittent green and infrared light, with light directed upward and an expected operation frequency of 1 to 2 nights per week. The RSLS will emit low light levels (approximately 10 times less than that needed to elicit a response in plants) (Narisad and Schreuder 2004). Plant communities near the lights should not be affected from RSLS operations. Thus, wireweed and pigeonwing populations near the lights should not be affected from RSLS operations. Due to small areas that will be impacted during construction and maintenance activities, the prohibition on the use of foreign material for road maintenance, and the requirement to coordinate with APAFR Natural Resources personnel to avoid impacting threatened and endangered plants in RSLS areas, the Service concurs with the APAFR determination that the proposed action may affect, but is not likely to adversely affect wireweed and pigeonwing.

This letter fulfills the requirements of Section 7 of the Act and no further action is required. If modifications are made to the project, if additional information involving potential effects to listed species becomes available, or if a new species is listed, reinitiation of consultation may be necessary.

FISH AND WILDLIFE RESOURCES

The BA prepared by APAFR discussed the potential impacts associated with light emission related to migratory bird species. The BA also cited studies that have been performed related to the light emission impacts on various bird species. As such, APAFR indicated that the RSLS was designed to minimized potential adverse impacts to migratory bird species. Under Section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.)

the Service does not consult on migratory birds. However, as a public trust resource, migratory birds must be taken into consideration during project planning and design. As such, the Service recognizes the considerations given to migratory birds in the planning of the RSLS project.

The bald eagle (*Haliaeetus leucocephalus*) has been protected in the United States since passage of the Bald and Golden Eagle Protection Act of 1940 (16 USC 668). Until recently, the bald eagle was also federally listed but was removed from the list on June 28, 2007, due to a dramatic recovery in population. The BA indicated one active bald eagle nest is located inside Echo Range, approximately 1 mile from lights #25 and #26, equidistant between the two. It is the opinion of APAFR that there should be no disturbance to the active bald eagle nest from lights at the currently proposed locations.

The proposed action will result in negligible impacts to native habitat resources based on the information provided. APAFR has indicated that APAFR Natural Resources staff will be consulted prior to and/or during installation activities. Provided this protocol is followed, the Service believes the proposed activities will not significantly impact fish and wildlife habitat resources.

Thank you for your cooperation and effort in protecting federally listed species. If you have any questions, please contact Brian Powell at 772-562-3909, extension 315.

Sincerely yours,

for Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc: electronic copy only
APAFR, Avon Park, Florida (Mark Fredlake)
FWC, Tallahassee, Florida (Mary Anne Poole, Jane Chabre, Traci Wallace)

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DEPARTMENT OF THE AIR FORCE
DETACHMENT 1, 23RD WING
AVON PARK AIR-GROUND TRAINING COMPLEX
MACDILL AIR FORCE BASE, FLORIDA, AND AVON PARK AIR FORCE RANGE, FLORIDA

26 January 2010

MEMORANDUM FOR USDI FWS SOUTH FLORIDA ECOLOGICAL SERVICES OFFICE
ATTN: MR. PAUL SOUZA, FIELD SUPERVISOR
1339 20th Street
Vero Beach, Florida 32960

FROM: DET 1, 23 WG/CC
29 South Boulevard
Avon Park Air Force Range, Florida 33825-9381

FILE COPY

SUBJECT: Biological Assessment for Avon Park Air Force Range (APAFR) Range Safety Lighting System (RSLS)

1. This Air Force (AF) Biological Assessment (BA) is submitted to fulfill requirements under Section 7 of the Endangered Species Act (ESA). This BA analyzes the potential effects to Florida grasshopper sparrow (FGS), Florida scrub jay (FSJ), red-cockaded woodpecker (RCW), bald eagle, Eastern indigo snake, wireweed, and pigeonwings from the proposed installation and operation of a Range Safety Lighting System (RSLS) at the Avon Park Air Force Range (APAFR). Also included are analyses of effects on migratory birds and gopher tortoise, a species currently under review for listing as threatened. The AF has determined that the proposed action will have no effect on wood stork (*Mycteria americanus*), Audubon's crested caracara (*Caracara cheriway*), Florida snail kite (*Rostrhamus sociabilis plumbeus*), and Florida panther (*Puma concolor coryi*) and does not wish to consult with the Service on these species.

2. Description of the Proposed Action: The Avon Park RSLS will consist of thirty solar-powered light sources around the north (Foxtrot/Bravo) and south (Charlie/Echo) range complexes; 8,300 and 10,500 acres, respectively. Each will be mounted on a ten-foot pole positioned at selected locations along the range perimeters (see Figures 1 and 2). Light locations, labeled 1 through 30 on Figure 2, were chosen through a process of exclusionary mapping and field verification to minimize environment impacts. The light source would be multiple light-emitting diodes (LED) encased in a clear dome. The diodes would emit both infrared and green light, and each unit would emit 120 lumens of steady or unblinking visible light in the green spectrum and invisible infrared light. As a comparison, a 100-watt incandescent bulb emits approximately 1,600 lumens (Clean Nova Scotia, 2004). Each individual light unit would consist of an arrangement of four Luxeon V Star™ green spectrum LEDs, which emit light at a wavelength of 505 nanometers (nm), and a center cluster of LEDtronics™ infrared LED lights, which emit light at a wavelength of 850 nm. Examples from a simnilar system installed at Saylor Creek Range at Mountain Home Air Force Base, Idaho, are shown in Figures 3 through 6.

3. Installation of Posts and Tree and Vegetation Removal: The lights would be spaced approximately one-mile apart and at the corners of the ranges. The AF would place the lights on the outside of and adjacent to existing range perimeter fence lines (Figures 7 through 9) so that

installation could occur with as little tree and brush clearing as possible. However, some tree clearing would be required. The AF used luminosity equations to determine that the Luxeon V-Star[tm] light would be visible at an altitude of 20,000-feet and a viewing angle of 69.2 degrees. As the viewing angle of an approaching aircraft remains constant, so do the ratios of altitude versus distance from the light source (Figure 10). Using these ratios, the height of vegetation that would obscure the lights at a given distance was determined. For example, a tree that is greater than 84-feet tall and located 200 feet from the light source would interfere with the approaching pilots' ability to see the light (Figure 10). A tree that is greater than 40-feet tall and located 80 feet from the light source would likewise require trimming or removal (Table 1). Stumps will be four-inches tall or less to avoid the potential to hit the undercarriage of vehicles. In addition, trees would need to be limbed to eliminate ladder fuels that can increase scorch height during prescribed burns and wildfires.

4. Access: All light locations can be accessed from main roads or from fence-line service roads or plantation disk lines from main roads. The exception is light location #18, where a four-wheel-drive truck would need to travel 0.3-mile from a main road across a Bahia-grass only cattle pasture.

5. Operation and Maintenance: The AF estimates the frequency of RSLS use would be one to two nights per week. Lights would operate up to eight hours per night, though mission personnel would turn on the lights only as needed. Mounted under a semicircular glass dome, lights would be visible from the air and from any horizontal direction. The pedestal upon which the lights would be mounted would prevent the lights from shining directly downward. Solar panels mounted on the light poles would collect power for storage in a 12-volt battery. The AF would control the lights remotely via radio signal. APAFR personnel would access the lights using existing roads and firebreaks, to the greatest extent possible. Maintenance activities include replacing batteries, maintaining vegetation around the lights, and other maintenance related to repairs due to lightning or other events. No foreign road material (clay, shell, yellow sand, etc.) will be used for access road maintenance. The AF assumes that lightning strikes will require up to six repairs or resets a year. APAFR personnel will maintain tree heights, clearing surrounding vegetation to the extent necessary to allow aircraft pilots a clear line of sight to the RSLS. Each lighting system would have a different tree-clearing radius, depending on the height of the vegetation and its proximity to the light. Vegetation and trees below the height of the lights (ten feet) would not be removed. If vegetation and trees must be cut, it would occur only at the ground level using equipment such as chainsaws and would not require any digging or vehicular machinery.

Table 1. Representative Tree Removal Scenarios

Distance from Light Source (in feet)	Maximum Tree Height (not blocking line of sight)
10	15
20	18
30	22
40	26
50	29
60	33
70	37
80	40
90	44
100	48
150	66
200	84

6. Modification of Light Locations: The original proposed light locations were modified by APAFR Natural Resources personnel, who examined preliminary locations and adjusted locations of proposed lights to avoid environmental effects. Thus, the light locations were developed through a process of exclusionary mapping and field verification. Changes to the proposed action involved moving lights a few hundred feet or less from their original proposed locations. One example of a location adjustment due to species considerations involves the Florida Scrub Jay (FSJ), a bird species that nests in low dense scrub. Light #7 was moved farther south to avoid FSJ habitat since the light poles may serve as perching spots for potential avian predators. In order to prevent avian predators from perching on the lights, bird spikes would be added to devices located in or near FSJ habitat. Bird spikes are an effective and safe solution to deter birds without harming people or wildlife or interfering with electrical or communication transmissions.

7. Florida Grasshopper Sparrow (Ammodramus savannarum floridanus) (FGS): FGS is federally and state-listed as endangered, with loss of habitat the primary reason for population decline (USFWS 1999). The FGS is endemic to the south-central dry prairie region of the state. FGS habitat is characterized as flat, treeless, fire-dependent grasslands with scattered shrubs (U.S. Air Force, 2000a). Since 1997, the FGS population at APAFR has declined by over 93 percent, from an estimate of 298 birds to 12 birds in 2007 (Tucker et al., 2008). The FGS habitat management units and current known sightings of FGS are shown on Figure 11. Light #22 is located within 400 meters of known FGS territories. The population of the FGS at APAFR has remained stable since 2003; however, it is at risk of extirpation, and intensive management is required to ensure the continued existence of this species at APAFR (Tucker et al., 2008). Suitable FGS habitat is found near light locations #18 through #22 along the eastern edge of Charlie/Echo Ranges and light locations #6, #7, and #8 along the edge of Bravo Range.

8. Florida Scrub Jay (Aphelocoma coerulescens) (FSJ): FSJ, a federal and state-listed threatened species, is declining due to residential, commercial, and agricultural development; altered fire regimes; and disease (USFWS 1999). The primary cause of nest failure in the FSJ is predation, which accounts for 67 percent of egg loss and 85 percent of nestling loss (Schaub et al., 1992). FSJ

is very specialized, inhabiting fossil dune ridges vegetated with xeric (subsisting on little water) oak scrub for nesting and foraging (Bowman et al., 2009). One such ridge, formed during the late Pleistocene, runs primarily north-south through the center of APAFR and supports four distinct regions of subpopulations of the FSJ. The four regions of the FSJ at APAFR are identified as North Ridge, South Ridge, Isolated, and River. Two of these, the North Ridge and South Ridge populations, are directly relevant to the project area, with stable habitat or territories located along some sections of range perimeters where lighting would be installed. Table 2 presents the most recent survey information for the sub-populations and identifies relevancy to the project area.

Table 2. Florida Scrub Jays by APAFR Survey Region

Survey Region	**North Ridge**	**South Ridge**	**Isolated**	**River**
Relevancy to Project Area	Stable FSJ territories along southwest **Bravo Range** Perimeter and **Bravo/Foxtrot Boundary**; and the west perimeter of **Alpha and Alpha Plus**	Stable FSJ territories along southwest perimeter of **Echo Range**	None. This region does not occur along the perimeter of ranges where lights would be placed.	None. This region is located about 0.6 mile from perimeter where lights would be placed on Charlie Range.
Year: 2005				
# Groups	22	15	13	4
# Birds	44A/12Y	29A/16Y	25A/8Y	5A/5Y
Average Group Size	2.5	3.0	2.5	2.5
Year: 2006				
# Groups	22	15	12	4
# Birds	46A/8Y	29A/8Y	28A/6Y	11A/1Y
Average Group Size	2.5	2.5	2.8	3.0

Source: Bowman et al., 2009

A=Adult; Y = Yearling

Grouped years represent the mean number of groups, mean number of birds, and mean group size of all the years combined.

9. Red-cockaded Woodpecker (Picoides borealis) (RCW). RCW is federally listed as endangered and state-listed as threatened. RCWs inhabit open, mature pine forest in the southeastern United States and prefer to nest in mature longleaf pines (USFWS 1999). RCW populations at APAFR are considered stable, being relatively unchanged from 1970s populations. Clusters are spread over the entire range with concentrated areas in the north-central/northwest, northeastern, and eastern parts of the range (US Air Force, 2000a) (Figure 12). Currently, there were 38 "managed" clusters at APAFR that supported 27 RCW groups. Managed clusters are "active or inactive natural or recruitment clusters that supported at least four cavities in good condition," providing suitable conditions for occupancy. "Unmanaged" clusters lack suitable trees, are highly isolated, and unlikely to be reoccupied without intensive management (Bowman et al., 2009a). With regard to the proposed action, the Foxtrot Range perimeter, particularly the north area between APAFR and River Ranch acres, supports several RCW active and inactive clusters (Figure 11). An active recruitment area and active clusters are located near the west Bravo perimeter, though not directly on it. An active cluster is located approximately 0.25 mile from the Charlie Range east perimeter.

10. Bald Eagle (Haliaeetus leucocephalus): The bald eagle has been protected in the United States since passage of the Bald Eagle Protection Act of 1940 (16 USC 668). Until recently, the bald eagle was also federally and state listed but was removed from the list on June 28, 2007, due to a dramatic recovery in population. As of 2006, 9789 breeding pairs of bald eagles occurred in the lower 48 states, a 20-fold increase in population since 1963 (USFWS 2008). Three nesting locations occur in APAFR (see Figure 11). None of the nesting locations are on or near the perimeter of the ranges where the RSLS would be installed. One active bald eagle nest is located inside Echo Range, approximately one mile from lights #25 and #26, equidistant between the two.

11. Eastern Indigo Snake (Drymarchon corais couperi): The eastern indigo snake is federally and state-listed as threatened. This snake attains lengths of eight feet, is blue-black in coloration, and is non-venomous. Indigo snakes are known to use gopher tortoise burrows to escape weather extremes. Loss of habitat and decline in gopher tortoise populations are the leading causes in the decline of eastern indigo snake populations. Approximately 50,000 acres of APAFR are upland communities serving as potential habitat to the eastern indigo snake. These communities include oak scrub, pine plantation, oak hammock, pine flatwoods, sand pine scrub, dry prairie, hardwood swamp, wetlands, and disturbed areas. Several confirmed sightings have occurred on or near roads (Bridges, 2004).

12. Pigeonwing (Clitoria fragrans): Pigeonwing, a federal threatened species, is an erect perennial herb belonging to the pea family. Pigeonwing occurs in scrub vegetation, turkey oak barrens, and at least at the edges of high pine. Known locations of pigeonwing are shown in Figure 14. Lewis and Stout (2005) studied the life history and local distribution of pigeonwing at APAFR for three years, providing the first quantitative data on these characteristics for this species. They examined uniquely marked individuals on seven permanent transects at APAFR weekly from March until September or October. They found that the frequency and survivorship of the two flower types, seed production and predation, and yearly survival of individuals vary with the season and frequency of fire events.

13. Wireweed (Polygonella basiramia): Wireweed, a federal threatened species, is a short-lived, perennial, taprooted herb that flowers for one or more years and does not often live beyond the third year. The habitat and life cycle requirements of wireweed have been more widely studied than those of pigeonwing. Wireweed is nearly restricted to the Florida scrub community of south-central Florida. In many places, wireweed grows along fire breaks, disk lines, and roads at APAFR.

14. Gopher Tortoise (Gopherus polyphemus): The gopher tortoise is currently listed as a state threatened species. A petition to list the species is currently under review (USFWS 2010). The tortoise is found primarily within the sandhills and open grassland ecological associations, where it excavates a tunnel-like burrow for shelter from climatic extremes and refuge from predators. The primary features of good tortoise habitat are sandy soils, open canopy with plenty of sunlight, and abundant food plants (forbs and grasses). Prescribed fire is often employed to maintain these conditions. Nesting occurs during May and June, and hatching occurs from August through September. Gopher-tortoise burrows serve as important habitat for many species, including the federally listed eastern indigo snake. A survey of the gopher tortoise population is currently underway at APAFR.

15. Migratory Birds: Migratory birds are protected by the Migratory Bird Treaty Act (1918, 16 USC Section 703, et seq.) and EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (2001). The Migratory Bird Treaty Act makes it unlawful to kill, capture, collect, possess, buy, sell, ship, import or export listed bird species, including their parts, nests or eggs, unless an appropriate federal permit is obtained. Under EO 13186, federal agencies are required within permitted law, availability of monies, budgetary limits and agency missions to:

a. Support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities, and by avoiding or minimizing adverse impacts on migratory bird resources.

b. Prevent or abate pollution or detrimental alteration of the environment for the benefit of migratory birds.

c. Design migratory bird habitat and population conservation principles, measures, and practices into agency plans and planning processes, and coordinate with other agencies and nonfederal partners in planning efforts.

d. Provide notice to the USFWS in advance of conducting an action that is intended to take migratory birds.

e. Minimize the intentional take of species of concern.

f. Identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations. See comment above.

Currently, the DoD is exempt from having to obtain permits for incidental takes of migratory birds for military readiness activities (Bearden, 2005). The exemption was granted per the 2003 National Defense Authorization Act (NDAA) until regulations for the issuance of permits for incidental takings of migratory birds during military training exercises are finalized (Bearden, 2005). The Secretary of the Interior is developing the regulations as directed by the NDAA. APAFR is located under a migratory pathway called the Atlantic flyway. Therefore, migratory waterfowl may be attracted to surface water and wetland habitats on or near the range. Major water bodies in the study area include Lake Arbuckle, Arbuckle Creek, and the Kissimmee River. Numerous swamps and marshes throughout the area also provide aquatic habitat. There are two normal migratory seasons: fall and spring.

16. Determination of Impacts: The analysis of potential impacts from the installation of the RSLS focuses on tree clearing and removal of foraging habitat. The analysis of potential impacts from operation of the RSLS is focused on the light produced by the RSLS and vegetation maintenance. The system itself is not expected to generate audible noise aside from perhaps a low electrical hum when operating. Noise from operation would be very minor in comparison to the existing military testing and training environment which is dominated by aircraft overflights, Army ground training, rocket launches, and natural noises, including intense and frequent thunderstorms and the natural noise environment.

17. Commonality Analysis for Protected Birds: As light-emission impacts are similar for most bird species, this commonalities section precedes the section on species-specific effects and pertains to all bird species analyzed in this document. There is a potential for lights to indirectly affect foraging behavior of nocturnal (nighttime species) or to expand foraging time of species that normally forage during the day. Though directed upward, some diffusion of light from the RSLS is expected to reach the ground and surrounding vegetation. Biological rhythms related to foraging, reproduction patterns, migration, communication, and sustainability can be affected by artificial light (Rich and Longcore, 2006). A study performed on the effects of roadway lighting on black-tailed godwits (Limosa limosa) in wet grassland habitats concluded that the density of nests was slightly but statistically lower up to 300 meters (m) away from the lighting at roadway and control sites. Songbirds may be impacted by some types of artificial light. The seemingly extended daylight hours created by artificial lights causes some birds to sing at unnatural hours. Scientists have determined that extended daylight hours can induce early breeding, longer feeding durations, and changing migration schedules (Molenaar et al., 2006). Although the studies cited above did find that lights did affect bird foraging and nesting behavior, the type of lighting proposed for the RSLS is drastically different from the lighting in those studies. Notably, these differences include a closer spatial arrangement of the lights than the proposed RSLS; a broad area of constant, higher intensity, and downwardly directed illumination; and a typically artificial white light spectrum as opposed to a single color. In addition, the lights will emit wavelengths in the infra-red and green portion of the spectrum. With these considerations, and with the understanding that RSLS would be spaced approximately 1 mile apart such that any diffuse illumination would be very local in nature, light from the operation of the RSLS at night (not including maintenance activities) is not likely to adversely affect any federally protected bird species, including migratory birds, detailed below.

18. Effects on FGS: FGS habitat would be potentially affected by RSLS installation at eight proposed light locations (Table 3). Since each lighting unit is self-contained and independently powered, noise and disturbance would be confined to the immediate area where the light pole would be placed. Power augers, chain saws, and vehicles would create brief noise disturbances during the installation and could temporarily affect this species. Perkins et al. (2003) found that areas ≤400 m of habitat edges acted as population sinks (i.e., mortality exceeded reproduction) and that areas >400 m from habitat edges (i.e., forest edges with vegetation >3 m tall and edges of improved pastures) were required for reproductive success to exceed mortality (i.e., population sources). It is likely that the mechanism behind this edge effect is higher rates of nest predation closer to elevated perches (Perkins and Vickery 2001). Unmodified light poles (as shown in Figure 5) will likely function as elevated predator perches and may result in increased predatory pressure on a small, "at-risk" FGS population. For example Kim and others (2003) found that American kestrels (Falco sparverius) used artificial perches more often than natural woody vegetation in south Texas coastal prairie grasslands. In order to reduce this effect, bird spikes will be installed and maintained at light locations #18 - #22 within FGS habitat in Echo Range.

Table 3. Grasshopper Sparrow HMU Within 500 Feet of Proposed Range Lights

HMU Name	Range Light ID
Bravo	6
	7
	8
Echo	18
	19
	20
	21
	22

HMU = Habitat Management Unit

Suitable habitat is found along several locations of the range perimeter where the Proposed Action would occur. If a FGS or nest was found during a survey, all operations would stop and APAFR Natural Resources would be contacted immediately. APAFR has determined that the Proposed Action may affect, but is not likely to adversely affect the FGS for the following reasons: the area cleared will be small, the disturbance will be temporary, and bird spikes will be installed to prevent long-term use by FGS predators.

19. Effects on FSJ: FSJ habitat would be potentially affected by RSLS installation at four proposed light locations (Table 4). Since each lighting unit is self-contained and independently powered, noise and disturbance would be confined to the immediate area where the light pole would be placed. Power augers, chain saws, and vehicles would create brief noise disturbances during the installation and could temporarily affect this species. While tree clearing in the vicinity of the lights may be needed, no clearing of oak scrub will be necessary for installation. The new lights may negatively affect FSJ if avian predators use them as perching spots. Woolfenden and Fitzpatrick (1996) reported that scrub-jays are vulnerable to predation by raptors in October, March, and April, when high densities of migrating accipiters and falcons are present. The Air Force will install bird spikes to RSLS lights located within FSJ habitat management units (HMU); specifically: sites 6, 7, 10, 11, 12, 13, 18, 24, 25, 26, 27 and 28; to prevent raptors from using them as perches. Bird spikes are an effective and safe solution to deter birds without harming people or wildlife or interfering with electrical or communication transmissions.

Table 4. Scrub Jay Territory and Sites Within 500 Feet of Proposed Action Lighting Locations

Range Light Number	Range	Territory ID	Breeding?	Group Size
11	Bravo	WEBR09	N	3
10		SEEP09	Y	2
6	Foxtrot/Bravo	NEXT09	Y	3
6		ENDD09	Y	4
28	Echo	NORE09	Y	2

*Nest Location

APAFR has determined that the Proposed Action may affect, but is not likely to adversely affect the FSJ for the following reasons: no clearing of scrub habitat will occur, the disturbance will be temporary, and bird spikes will be installed to prevent long term use by FSJ predators.

20. Effects of noise disturbance on RCW: Land clearing, machinery operations, and construction may disturb RCW individuals or populations. Foraging RCWs may avoid areas where construction is occurring; however, installation would only last a few days and disturbance should be minor. The nearest active tree is over 100 meters from the nearest RSLS light. RCWs can acclimate to excessive noise levels and adapt to noise associated with military missions and ground operations (Delaney et al., 2002). Potential disturbances during construction and maintenance would be short term. A small increase in human traffic during maintenance and repairs for the RSLS would not likely affect RCWs nearby.

21. Effects of tree clearing on RCW: No RCW cavity trees would be removed during the clearing activities for RSLS installation, but RCW foraging area would be affected by the removal of trees at a few proposed light locations. South/Central Florida Recovery Unit Foraging Guidelines for Satisfying the Standard for Managed Stability for RCWs (USFWS, 2006) were used as the basis for determining effects of pine removal on RCW. Under these guidelines, each breeding pair of RCW must have at least 75 acres of foraging habitat, consisting of stands of native long-leaf pine, native slash pine, or planted pine of either species, within one-half mile of the cluster epicenter. A minimum of 3,000 square feet of pine basal area must be available within these stands, at least 2,000 square feet of which must consist of pines greater than nine inches diameter at breast height (DBH). The remainder can consist of pines between four inches and nine inches DBH. The analysis, presented in Table 5, compares current pine basal area with the post-removal condition for the clusters near RSLS light locations. Light locations within a cluster area that do not require any tree removal result in a conclusion of "no effect." Pine removal within a cluster which does not result in a decrease of forage habitat below the minimum standards would "not likely adversely affect" RCW forage. Lights #1, #2, #13, #14 and #17 are within RCW foraging habitat; however, they either require no tree clearing or tree clearing would not appreciably reduce the quality of the habitat (Table 5, Figures 11 and 12). Even though a process of exclusionary mapping was carried out to reduce effects to RCW, the small removal of foraging habitat is unavoidable. Tree removal has the potential to affect RCW forage habitat in clusters 7 and 54 (Table 5). Cluster 7 currently has 150 acres of foraging habitat and has the minimum allowable basal area of forage (2,000 square feet) for pines greater than nine inch DBH. Twenty square feet of basal area of pines greater than four inch DBH will be removed to provide necessary visibility angle. This amount is less than 1% of available resources for cluster 7; therefore, the effect will be small and discountable. Cluster 54 currently has 2,600 square feet of pines greater than nine inches DBH but falls short of the total forage requirement (3,000 square feet for pine greater than four inches DBH). Pine removal from Cluster 54 will amount to three square feet of basal area, less than 0.1% of the available resources for that cluster, thus it will have a small and discountable effect. It is anticipated that the loss in both cluster 7 and 54 will be temporary and that natural growth and recruitment of seedling and saplings into the forage base will compensate for this short-term reduction. Hence, the Air Force concludes that the RSLS may affect, not likely to adversely affect RCW.

Table 5. Tree Clearing Effects on RCW Forage Area

Light Number	Cluster(s) with center(s) w/in one-half mile of light	Total Available Forage (Acres)	Available forage (ft^2 of BA) of pines greater than 9" DBH	Forage removed - pines greater than 9" DBH	Remaining forage - pines greater than 9" DBH	Available forage (ft^2 of BA for pines 4" DBH or greater)	Forage, pines- 4" DBH or greater, that would be removed	Remaining forage, pines- 4" DBH or greater, after removal	Basal area requirement met After RSLS Tree Removal?	Conclusion
#1	#7	150 acres	2000 ft^2	18 ft^2	1982 ft^2	2020 ft^2	20 ft^2	2000 ft^2	No	NLAA : #7 is at minimum for pines greater than 9" DBH, removal would affect less than 1% of forage
#2	#36	210 acres	6100 ft^2	9 ft^2	6091 ft^2	7500 ft^2	10 ft^2	7490 ft^2	Yes	NLAA; Basal area requirement met after removal
#12A	#5,#16	100, 190 acres	600 ft^2, 11000 ft^2	None	600 ft^2, 1110 ft^2	2700 ft^2, 11150 ft^2	None	2700 ft^2, 11150 ft^2	Yes, no removal	No Effect
#12B	#5, #16	100, 190 acres	600 ft^2, 11000 ft^2	None	600 ft^2, 1110 ft^2	2700 ft^2, 11150 ft^2	None	2700 ft^2,11150 ft^2	Yes, no removal	No Effect
#13	#21	275 acres	4600 ft^2	None	4600 ft^2	5530 ft^2	None	5530 ft^2	Yes, no removal	No Effect
#14	#57	400 acres	8000 ft^2	79 ft^2	7921 ft^2	11000 ft^2	88 ft^2	10912 ft^2	Yes	NLAA; Basal area requirement met after removal
#16	#54	210 acres	2600 ft^2	3 ft^2	2597 ft^2	2600 ft^2	3 ft^2	2597 ft^2	No	NLAA; #54 is under minimum for total available forage, removal would affect less than 0.1% of forage
# 17	#31	180 acres	3100	1 ft^2	3099 ft^2	3100	2 ft^2	3098 ft^2	Yes	NLAA; ; Basal area requirement met after removal

DHB= diameter at base height; **NLAA**=not likely to adversely affect; **BA**=basal area; **ft^2**=square feet

22. Effects on bald eagle: None of the bald eagle nesting locations are on or near the perimeter of the ranges where the RSLS would be installed. There should be no disturbance to the active bald eagle nest from lights at the currently proposed locations. APAFR concludes that the Proposed Action may affect, but is **not likely to adversely affect** bald eagles.

23. Effects on eastern indigo snake: The RSLS lights would be directed upward. It is unknown whether the outward diffusion of light from the RSLS would be sufficiently intense enough, or within close enough proximity, to cause disorientation for indigo snakes. The RSLS would also emit infrared light, which is detectable by some species of snakes from the Crotalid or pit viper family. Pit vipers include rattlesnakes, water moccasins, copperheads and coral snakes, all of which are venomous. It is unknown if indigo snakes could detect infrared light. Since the RSLS lights would be elevated approximately 10 feet above the ground, attraction is not likely to be a concern for these snakes. APAFR will implement USFWS standard protection measures of eastern indigo snake (USFWS 2004), including educating worker on recognition and avoidance measures. APAFR concludes that the Proposed Action may affect, but is not likely to adversely affect the indigo snake.

24. Effects on wireweed and pigeonwing: Installation of the RSLS would require the clearing of trees and shrubs at some of the light locations to allow personnel access to the lights and a clear line of sight by pilots. Analysis of available plant information indicates that hairy wireweed and pigeonwing are located within 500 feet of several light locations (see Table 6). These plants would potentially be susceptible to direct impacts from equipment/vehicles during installation and maintenance of the RSLS. Lights #24, #25 and #26 will be accessed on existing roads to avoid protected plant species. Impacts to wireweed at Light #12B may be unavoidable because the only access route to the light location would be down the disk line, where the plants are growing. This area is maintained by disking once or twice annually. The periodic disking actually encourages site conditions for wireweed, and the fire break helps to maintain a stable population. The plant grows in the disk line and cannot be avoided; however, the plant is an annual and recovers quickly. To reduce the risk of invasive plant colonization, no foreign road material (clay, shell, yellow sand, etc.) be used for access road maintenance. Installers will coordinate with APAFR Natural Resources personnel to avoid driving over rare plants in areas with no established roads. The APAFR RSLS would be an intermittent green and infrared light, with light directed upward and an expected operation frequency of one to two nights per week. The RSLS would emit low light levels (approximately 10 times less than that needed to elicit a response in plants) (Narisad and Schreuder, 2004). Plant communities near the lights should not be affected from RSLS operations. Thus, wireweed and pigeonwing populations near the lights should not be affected from RSLS operations. Due to small area that would be impacted during construction and maintenance activities, the prohibition on the use of foreign material for road maintenance, and the requirement to coordinate with APAFR Natural Resources personnel to avoid impacting threatened and endangered plants in areas APAFR has determined that the Proposed Action may affect, but is not likely to adversely affect wireweed and pigeonwing.

Table 6. Protected Plants Within 500 Feet of Proposed Lighting Locations

Range Light Number	Range	Species	# of Individual Plants	Year Surveyed
12B	Bravo	Pigeonwing	17	2002
14	Foxtrot		7	2003
26	Echo		45	2002
			200	2002
28	Echo	Wireweed	2000	2003
27	Echo		15000	2003
27	Echo		10000	2003
26	Echo		100	2004
26	Echo		2200	2004
25	Echo		1500	2004
24	Echo		1500	2004
12B	Echo		35	2004
12B	Bravo		107	2002
12B	Bravo		63	2002

25. Effects on gopher tortoise: Construction activities may result in temporary disturbance to gopher tortoise. Personnel involved in the installation and maintenance would be informed of the protected status of these species in case of a chance encounter. The locations will be surveyed for gopher-tortoise burrows, and burrows will be avoided during construction. Because the RSLS lights would be operated one to two nights per week, turned on only as needed during a given mission, and that the gopher tortoise is not a nocturnal animal, it is unlikely that long-term changes in habitat or behavior in gopher tortoises would result from the installation of the RSLS.

26. Effects on migratory birds: The impact to migratory birds is expected to be minimally adverse as the available scientific literature indicates that birds do not see green light well and thus are not strongly attracted to it (Rich and Longcore, 2006). The concern with regard to attraction would be that migrating birds could deviate from their natural course or "fall out" (land in large numbers) onto range areas where active missions were occurring, posing a safety hazard to both birds and humans (i.e., aircraft collision risk). Collisions, commonly noted with lit cell and radio towers and tall buildings, are unlikely to occur with the RSLS. The causative factors in bird-tower collisions are the height of the structures, flight altitudes of birds, whether the towers are supported by guy wires, and the color and type of light. Fixed red lights or white lights have the highest incident of bird mortality from collision. Flashing or strobe lights have been found to reduce bird attraction to communication towers, regardless of light color (Gauthreux and Belser, 2006). The height of the RSLS lights (ten feet) and the minimal attraction of birds to green light suggest that the potential for birds to collide with RSLS lights is low. It is unlikely that the RSLS would pose such an attraction due to the color

and expected frequency of operation of the lights. Studies of bird response to lit radio towers indicate that birds exhibit more non-linear flight (meaning they circle the tower or deviate from straight path flight) based on the type of light on the tower. Red visible light was found to have the greatest effect, and it is theorized that certain colors interfere with the magnetoreception mechanisms that birds use during migration to navigate (Gauthreux and Belser, 2006). In a study of bird attraction to offshore petroleum structures, birds did not exhibit a response to infrared light, which is not part of the visible light spectrum (Poot et al., 2008). Wiltschko and others (2004) found that migratory birds became disoriented from their migratory direction in the presence of 590 nm yellow or 635 nm red light but remained well oriented under green light up to 564 nm, even when pre-exposed to darkness. Wiltschko et al. (1993) observed lower activity with blue light but attributed that to the strength of the bulb, which raised the temperature slightly, likening the lower activity to the damping effect heat has on autumn migratory activity. This study concluded no difference between green and blue light regarding misorientation with test subjects. The RSLS would emit green light at 505 nm. Rappl and others (2000) concluded that light wavelength dependent magnetoreception was widespread among birds given that experiments had shown this mechanism to be present in birds from different orders and three different families. Their experiments with pigeons found that magnetic orientation in these species was not affected by green light, whereas red light did cause misorientation, similar to experiments with robins, thrushes, and warblers (Wiltschko et al., 1993; Wiltschko and Wiltschko, 1995; Wiltschko and Wiltschko, 1999).

27. Conclusion: There is a potential for the RSLS to affect protected species at APAFR due to direct disturbance from RSLS installation and operation. However, these potential effects should be small and discountable given that installation will be coordinated with APAFR Natural Resources personnel to mitigate impacts to protected plant and animal species, the RSLS would be operational for a maximum of only one or two nights per week for eight hours per night, and the RSLS system emits only green and infrared light. All construction personnel would be briefed on potential endangered species concerns before construction and operation of the RSLS in endangered species habitat, and contract clauses would require coordination with APAFR Natural Resources. The AF concludes that the proposed action may affect but is not likely FGS, FSJ, RCW, bald eagle, eastern indigo snake, wireweed, and pigeonwing. The AF believes this fulfills all requirements of the ESA and requests that the Service concur with our determinations.

28. APAFR would notify the Service immediately if it modifies any of the actions considered in this Proposed Action or if additional information on listed species becomes available, as the Service may require a reinitiation of consultation. If effects occur beyond those considered in this assessment, all operations would cease, and APAFR would notify the Service. If you have any questions regarding this letter or any of the proposed activities, please contact me at (863) 452-4196 or Mark Fredlake at (863) 452-4257.

CHARLES E. MACLAUGHLIN, Lt Col, USAF
Commander

2 Attachments
1. Figures 1-14
2. References

cc:
USFWS (Julie Jeter)

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APPENDIX F

CULTURAL RESOURCE CONSULTATIONS

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Charles E. MacLaughlin
Department of the Air Force
DET 1, 23 WG/CC
29 South Boulevard
Avon Park Air Force Range, Florida 33825-9381

March 22, 2010

RE: DHR Project File Number: 2010-723
Initiation of Section 106 Consultation for the Range Lighting Environmental Assessment at Avon Park Air Force Range
Polk and Highlands Counties

Dear Mr. MacLaughlin:

Our office reviewed the referenced project for possible impact to historic properties listed, or eligible for listing, in the National Register of Historic Places. The review was conducted in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR Part 800: Protection of Historic Properties.

We concur with the recommended actions regarding cultural and historical resources, and it is our opinion that such resources will be adequately addressed by the proposed actions.

If you have any questions concerning our comments, please contact Samantha Earnest, Historic Preservationist, by electronic mail *swearnest@dos.state.fl.us*, or at 850-245-6333.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

Director's Office (850) 245-6300 • FAX: 245-6436
Archaeological Research (850) 245-6444 • FAX: 245-6452
Historic Preservation (850) 245-6333 • FAX: 245-6437

DEPARTMENT OF THE AIR FORCE
DETACHMENT 1, 23RD WING
AVON PARK AIR-GROUND TRAINING COMPLEX
MACDILL AIR FORCE BASE, FLORIDA, AND AVON PARK AIR FORCE RANGE, FLORIDA

17 February 2010

MEMORANDUM FOR DEPARTMENT OF STATE (ATTN: MR. SCOTT STROH)
Division of Historical Resources
Review and Compliance Section
R.A. Gray Bldg
500 South Bronough Street
Tallahassee FL 32399-0250

FROM: DET 1, 23 WG/CC
29 South Boulevard
Avon Park Air Force Range, Florida 33825-9381

FILE COPY

SUBJECT: Initiation of Section 106 Consultation for the Range Lighting Environmental Assessment at Avon Park Air Force Range

1. Avon Park Air Force Range (APAFR) is in the early stages of planning for a range improvement project that is subject to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act (16 USC470f). Pursuant to these regulations, APAFR is initiating consultation with your office regarding the undertaking.

2. The undertaking, known as the Range Safety Lighting System (RSLS) at APAFR, calls for the Air Force to install an RSLS around the perimeter of the north and south range complexes at APAFR to allow pilots conducting nighttime ordnance training to easily see APAFR. The RSLS would consist of 30 green and infrared spectrum lights elevated on 10-foot poles and evenly spaced around the perimeter of the north and south ranges. Air Force Instruction 13-212, *Range Planning and Operations*, states that Class B ranges must have light patterns to ensure positive range and target area identification unless an Operational Risk Management Assessment has determined otherwise. The Area of Potential Effects of the undertaking, currently in the NEPA scoping stage, is presented in the enclosure.

3. As required by 36 CFR 800.4(a), APAFR is also requesting the views, to include concurrence for the project to proceed or not, of the State Historic Preservation Officer and your office on further actions to identify historic properties that may be affected by the installation of the RSLS.

4. If you have any questions or concerns about the undertaking at this time, please contact Ms. Kathy Couturier, APAFR Cultural Resources Manager, at (863) 452-4119 ext 329 or via email at kathy.couturier@avonpark.macdill.af.mil.

CHARLES E. MACLAUGHLIN, Lt Col, USAF
Commander

Attachment:
Documentation Requirements

cc:
CEVN (Kathy Couturier)

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APPENDIX G

PUBLIC AND AGENCY INVOLVEMENT

McKee, Walter J. (Jamie)

From: prvs=1573705c07=coreystutte@polk-county.net on behalf of Stutte, Corey [coreystutte@polk-county.net]
Sent: Wednesday, November 25, 2009 8:58 AM
To: McKee, Walter J. (Jamie)
Cc: Ku, Rachel
Subject: APAFR Environmental Assessment

Mr. McKee,

I have received the APAFR environmental assessment. I am writing to inform you that after review, Polk County has no comment on the improvements. Please let me know if you have any further questions.

V/r,

Corey T. Stutte, Ph.D.
Planner
Land Development Division
Growth Management Department
Polk County Board of County Commissioners

I will never forget that I am an American, fighting for freedom, responsible for my actions, and dedicated to the principles which made my country free. I will trust in my God and in the United States of America. (Article 6, Code of Conduct)

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